Draft Environmental Impact Statement

Xcel Energy 345 kV Transmission Line From Split Rock Substation to Nobles County Substation to Lakefield Junction Substation and the 115 kV Transmission Line From Nobles County Substation to Chanarambie Substation and the Nobles County Substation

In Rock, Nobles, Murray and Jackson Counties

State of Minnesota

Environmental Quality Board

Docket No.: 03-73-TR-XCEL

January, 2005

Responsible Governmental Unit	Project Owner
Minnesota Environmental Quality Board **658 Cedar Street, Room 300** **St. Paul, MN 55155** **EQB Representative:** **John N. Wachtler** **(651) 296-2096**	**Northern States Power Company, a Minnesota Corporation d/b/a Xcel Energy** **414 Nicollet Mall** **Minneapolis, MN 55401** **Project Representative:** **Pamela J. Rasmussen** **P. O. Box 8** **Eau Claire, WI 54702-0008** **(715) 839-4661**

ABSTRACT

Xcel Energy has applied to the environmental quality board for one route permit for two new high-voltage transmission lines and one new substation in Southwest Minnesota. The larger of the two lines is an approximately 86-mile 345-kilovolt line running east from the Split Rock Substation near Sioux Falls, South Dakota to the Lakefield Junction Substation in Jackson County, Minnesota. The other is a new approximately 40-mile 115-kilovolt transmission line connecting a new substation near Reading, Minnesota in Nobles County with the existing Chanarambie Substation in Murray County. The route permit will also designate the site for the new Nobles County Substation, which will interconnect the two transmission lines. The two primary routes for the 345-kV line are either along Interstate I-90 or on the same right-of-way as an existing transmission line running two to five miles north of I-90. The potential routes for the 115 kV line mostly follow county roadways or existing 69-kV transmission right-of-way. The routes for the new transmission lines are evaluated based on a number of criteria, including (1) minimizing distances to homes, (2) avoiding farming conflicts, (3) minimizing waterfowl collisions, (4) maximizing wind energy development, and (5) minimizing cost, construction time, and impacts on grid reliability. More details about the place and time of the hearing and the project can also be found online at http://www.eqb.state.mn.us/Docket.html?Id=6466.

DRAFT EIS COMMENTS DUE BY FEBRUARY 22, 2005

The EQB wants the best information possible for this route decision. Formal comments on the accuracy and completeness of the draft EIS will be accepted until **Tuesday, February 22, 2005**.

Comments on the draft EIS should be sent by e-mail or U.S. mail to:

John N. Wachtler
Environmental Quality Board
3rd Floor Centennial Building
658 Cedar Street
St. Paul, MN 55155
e-mail: john.wachtler@state.mn.us

EIS INFORMATION MEETINGS

EQB rules not only require a public hearing (described below) but also a pre-hearing public information meeting to accept comments on the draft EIS, answer questions, and provide information on the upcoming hearing:

The EQB staff will hold pre-hearing information meetings from 4:00 p.m. to 8:30 p.m. at the following three dates and locations in southwest Minnesota:

- Rock County Library, Luverne, 201 West Main Street, February 2, 2005
- Lakefield Senior Citizen Center, 112 South Main Street, February 8, 2005
- Reading Community Center, 26991 200th St, Reading, February 9, 2005

Each of these pre-hearing information meetings will be held using an open-house format. You are invited to stop by when it is convenient, to review the proposed project and maps, review and comment on the draft EIS, and to learn more about the upcoming hearings. Each meeting will also include a brief EQB staff presentation at **7:00 p.m,** followed by an open public comment opportunity.

FINAL EIS

After the comment period, the EQB staff will prepare a final EIS. The final EIS will include revisions to the draft EIS as well as staff responses to substantive comments on the draft EIS.

PUBLIC HEARING SCHEDULED

Before the EQB makes a final decision, it must hold a public hearing. The hearing will be conducted by an independent administrative law judge (ALJ), Judge Allan W. Klein. At the hearing, anyone can provide comments regarding routes, structures, and other permit conditions. Persons

may testify at the hearing without being first sworn under oath. The ALJ shall ensure that the record created at the hearing is preserved and transmitted to the EQB. The ALJ will prepare a report that will include proposed findings of fact and conclusions and a recommendation on routes.

Hearing sessions will take place at the following four locations:

- Lakefield Senior Citizen Center, 112 South Main Street, March 1, 2005
- Wilmont Community Center, 316 4th Avenue, March 2, 2005
- Luverne Rock County Library, 201 West Main Street, March 3, 2005
- Chandler City Center, 241 4th Street, March 4, 2005

There will be an afternoon session and an evening session at each location. The afternoon session will convene at 2:00 p.m. and the evening session will convene at 7:00 p.m. It is not necessary to attend more than one session to have your input heard and included in the record.

Table of Contents

List of Appendices

List of Figures

List of Tables

SECTION 1.0 SUMMARY AND CONCLUSIONS

Lack of transmission infrastructure restricting wind development on Buffalo Ridge

Wind energy production in southwest Minnesota has outstripped the delivery capacity of the transmission system. On windy days, the approximately 700 wind turbines on Buffalo Ridge can produce up to 580 megawatts of electricity. (See Figure 1.) Therefore, their output often exceeds the 260-megawatt firm outlet capacity of the existing transmission infrastructure. In the past year Xcel Energy has completed projects that allow the transmission system to provide 425 MW non-firm outlet capacity. Hundreds more megawatts of planned wind projects await available transmission.

Following an extensive review process, the Minnesota Public Utilities Commission in March 2003 determined that four new high-voltage transmission lines were needed to help increase transmission outlet capacity to approximately 825 megawatts.

Two new lines proposed: 345-kV between Sioux Falls and Lakefield, and 115-kV through Nobles and Murray counties

Xcel Energy has applied to the EQB for one route permit for two of the four PUC approved lines. The first is the "backbone" of the needed improvements—a 345-kilovolt (345-kV) line that will run east-west for about 86 miles from the Split Rock Substation near Sioux Falls, SD to the Lakefield Junction Substation in Jackson County, MN. The second is an approximately 40-mile long 115-kV line running from a new substation near Reading, MN in Nobles County northwest to the existing Chanarambie Substation in Murray County. The route permit will also identify the site of the proposed Nobles County Substation. (Figure 2)

Regarding the other two PUC approved lines, the EQB has issued a route permit for the Fox Lake to Lakefield Junction 161-kV line, and the route permit for the Buffalo to White 115-kV line is pending.

EQB permit designates transmission route and structure type

The EQB rules regarding route permits require a number of procedural steps, including public notice, information meetings, a draft and final environmental impact statement (EIS), a public contested case hearing, and finally a decision by the full EQB. Minn. Rules Chapter 4400. The primary purpose of this EIS is to help the EQB make an informed decision on the best route and structure types for the two new transmission lines. The EQB route permit will designate the routes, structures, and other permit conditions. The EQB may also determine whether the structures should be capable of having a second high-voltage circuit installed in the future (a "double-circuit").

EQB permit usually allows flexibility for final design

Under the Minnesota Power Plant Siting Act, a "route" may have a variable width of up to 1.25 miles. In this case, Xcel Energy has requested a route width of 660 feet on each side of a center line for most

areas in order to allow for flexibility during final design. Xcel Energy has requested a 1.25-mile wide route near the Chanarambie Substation, which is already congested with lower voltage lines and wind turbines. Providing this flexibility allows Xcel Energy to evaluate how best to consolidate the new and existing lines and get input from landowners on detailed design issues such as pole placement.

However, once the EQB issues its route permit Xcel Energy can, if necessary; exercise its eminent domain authority to acquire easements within the designated route. So for some areas the EQB can and may limit the new power line to a more specific route in order to ensure the protection of sensitive areas or in response to specific landowner concerns. The EQB can also designate wider routes in other areas in order to allow greater final design flexibility.

Two main routes for 345-kV line: Along I-90, or double-circuit with existing 161-kV transmission line

To minimize the need for new right-of-way, high-voltage transmission lines often share right-of-way with existing roads or transmission lines. For the proposed 345-kV transmission line, there are two potential routes: (1) Interstate-90 (I-90 route), and (2) an existing 161-kV transmission line that runs parallel to, and two to five miles north of, I-90. The second route is often referred to as the "Alliant route" because most of the line is owned by Alliant Energy. Importantly, it is also possible to use a combination of the two routes. There is also a separate 161-kV line owned by Alliant Energy south of the City of Lakefield in Jackson County that is available for corridor sharing on either route.

Both the I-90 and the Alliant route require some new right-of-way. For example, on the I-90 route the line would have to turn north of the interstate near Worthington to avoid the airport. And the Alliant route requires five or more miles of new right-of-way in Jackson County.

Xcel Energy's two proposed routes for the 345-kV line are shown in Figures A1 through A3 in Appendix A. Three other alternative routes in Jackson County are highlighted in Figures A4 and A5. The costs and impacts of selected routes are compared in Table 1 below, and data for all route segments are provided in EIS Appendix H.

Xcel Energy prefers I-90 route for 345-kV line

Xcel Energy prefers the I-90 route to the Alliant route for a variety of reasons, including:

- Lower Cost ($49.7 million vs. $58.2 million);
- Faster Construction (Xcel Energy estimates it will take at least an extra year to construct the line on the Alliant route, although exactly how much longer is unresolved);
- Less completely new right-of-way (about three to five miles less)

115 kV line: Many routes available; major considerations include impacts on farming, residences, and waterfowl as well as cost.

The 115-kV line will help improve outlet capacity and serve as a major interconnection point for nearby wind turbine projects. There are numerous roads and three lower voltage transmission line routes available for right-of-way sharing. In Murray County, the primary routes are along 70th Avenue, (West route), County Highway 28 (East route), or County Highway 29 (East route). In Nobles County, there are numerous route segments, mostly along township roads, that can be combined into routes through that area.

Xcel Energy's two proposed routes for the 115-kV line, including their preferred East route, are shown in Figure A6 in Appendix A. Figures A7 and A8 in Appendix A highlight three other possible route alternatives (variations on Xcel Energy's routes). Comparison data for the selected routes are shown in Table 1. Data for all route segments are provided in Appendix H.

For 115-kV line, Xcel Energy prefers the "East" route largely because of cost.

For the 115-kV line, Xcel Energy prefers its "East" route primarily because it costs about $2 million less than "West" route options. The "West" routes use existing 69-kV right-of-way for about 13 miles of the 36-mile route, reducing the need for new right-of-way. But this route sharing comes at a price: double circuit 115/69-kV lines cost about $150,000 more per mile than single circuit 115-kV lines.

On the other hand, the "West" routes pass near somewhat fewer homes and waterfowl areas than "East" routes. There are other differences on both routes at a local, segment-by-segment level. In both counties, the use of new right-of-way along section lines is being considered in order to avoid nearby farmsteads along roads. Finally, there are also no apparent differences regarding interconnection for future wind projects since all nearby areas have similar wind development potential.

Xcel Energy plans mostly single-pole structures for all routes

For both lines, Xcel Energy has proposed using steel single-pole structures wherever feasible primarily to minimize farming conflicts. Single steel poles cost more but are less intrusive than wooden H-frame supports or other alternatives. For the 345-kV line, the proposed structures would be about 120- to 140-feet tall, with average spans of about 950 feet. For the 115-kV line, the poles would be about 70 to 80 feet tall, with average spans of about 400 feet. Other structure types may be necessary near waterfowl areas or interstate crossings.

Route decision primarily balances impacts on residences, farming, waterfowl, cost and construction time

The factors the EQB is to consider in its permit decision are listed in the Minnesota Power Plant Siting Act and related rules. See Minn. Stat. §116C.57, Subd. 4, and Minn. Rule part 4400.3150. Direct impacts to wetlands and remnant prairie areas can be avoided almost entirely on all potential routes. No direct impacts are expected to archeological resources, large woodlands or other unique natural or environmental

resources on any route under consideration. One section of the Alliant route does cross the Rock River, which is a designated critical habitat for the Topeka Shiner, a minnow on the federally endangered species list. Special construction techniques will be required along the Rock River if the Alliant Route is selected

Therefore, the route decision is primarily a balancing of the following criteria:

- Minimize interference with farming operations;
- Avoiding homes to reduce exposure to magnetic fields and minimize aesthetic impacts (people don't like to look at them);
- Minimize loss of tree groves and reduced property values;
- Minimize waterfowl and other bird collisions;
- Minimize cost and construction time, and maintain reliability.

Using existing transmission line route nearly eliminates need for new right-of-way

When sharing right-of-way with existing transmission lines, Xcel Energy is proposing to tear out the existing lines and install the new and old lines together on one set of new single-pole structures (double-circuit). This minimizes new right-of-way requirements compared to installing the new line parallel to the old. For the 345 kV line, this would result in a 161/345 kV double circuit. For the 115 kV line, this would result in a 115/69 kV double circuit. (Xcel Energy will be compensating landowners for new easements required to accommodate the double circuit lines.)

Paralleling roadways reduces but does not eliminate need for new right-of-way

Paralleling roadways, on the other hand, reduces but does not eliminate the need for new right-of-way. In part, this is because along roadways Xcel Energy plans to install poles just outside public right-of-way—about five feet into fields or other private property. This is partly for safety reasons, but also to avoid potential liability for the cost of moving the poles if the roadway is expanded in the future. Also, along I-90, the Minnesota Department of Transportation requires that poles be placed outside the highway right-of-way except in hardship situations. For the 345-kV line, paralleling a roadway reduces the width of the required transmission line right-of-way from 150 feet to 80 feet. For the 115-kV line, it reduces the required transmission right-of-way width from 75 feet to 42.5 feet. (EIS Figures 7 and 8.)

Most area farmers seem to prefer locating the poles along roadways rather than along section lines or farther into fields. However, the concrete and steel transmission structures at the edge if fields require more care when turning farm vehicles. And some farmers stated that the structures at the edge of fields still increases the possibility of

accidental collisions with farm equipment, requires extra weed control, and presents hazards to crop-dusting planes.

Major advantage of Alliant route is minimal new right-of-way, reduced farming conflicts, with exceptions

The major advantage of the Alliant route is that double-circuiting with the existing 161-kV line would minimize the need for new right-of-way along much of the route. However, completely new right-of-way is still needed where the 161-kV line turns north to Heron Lake, in Jackson County. The I-90 route, on the other hand, requires some new right-of-way along most of its length. While the Alliant route would avoid disrupting views along I-90 and minimize problems or concerns for existing residences and businesses along the interstate, it would have an aesthetic impact along the existing 161-kV route because the new poles would be about fifty feet taller than the old.

The Alliant route would also have less impact on farming operations. In many areas the 50-year old H-frame structures would be replaced with a new double-circuit line on single pole structures. This would actually reduce impact on farming because the existing H-frame structures have two poles that straddle the section line into fields. The new five to eight-foot wide foundations for the single poles would be larger than existing foundations, but they would mostly be located right on the section line. Also, the spans would be longer, so fewer structures are required.

Alliant route requires careful construction process in order to maintain reliability and avoid delay

In general, double-circuit transmission lines reduce grid reliability because they make it more likely that one event, such as an ice storm, could take both lines out of service at the same time. However, Xcel Energy believes a double-circuit 161/345-kV line on the Alliant route would not create any significant long-term reliability problems.

However, special procedures would be required to maintain reliability during construction. Removing the old 161-kV line, installing the larger structures needed for a double circuit line, and using special construction procedures would cost an estimated $7.3 million dollars more and require longer construction times—perhaps up to 16 months longer—compared to the I-90 route. Xcel Energy and other utilities are continuing to study how best to maintain reliability and complete construction as quickly as possible if the EQB selects the Alliant route.

Major advantage of I-90 route is faster construction and lower cost

The major advantage of Xcel Energy's preferred I-90 route is that it would cost about 14 percent less than using the Alliant route ($7.3 million less), and take less time to construct. The quicker the new 345-kV line can be built the sooner curtailments on existing turbines and restrictions on future wind development will be reduced. Also, the Alliant route requires at least five miles of entirely new right-of-way along township roads or in farm fields in Jackson County to connect into the Lakefield Junction Substation. Little completely new right-of-way is required in that area for the I-90 route.

New substation required in Nobles County

A new substation is also required to interconnect the new 115-kV line with the new 345-kV line. Three substation areas near Reading, MN are under consideration. The sites are shown in Appendix C and compared in EIS Section 5. The substation site requires a minimum of 15 acres, but Xcel Energy intends to purchase a site with a minimum of 40-acres to provide a buffer zone and minimize future land use conflicts.

There are only minor environmental differences between the potential substation sites, although there are slightly more residences near the two sites closest to Reading (Sites A and B) than at the site about three miles to the west (Site C). But one landowner in Site C has indicated they are building a new house near the existing Alliant line. Costs are essentially the same for all sites. There is a somewhat higher probability of archeological resources at Site C, so a survey would be needed prior to site construction.

There are also other considerations. First, the new substation will serve as an important interconnection point for 34.5-kV "feeder" transmission lines from future wind turbines. Second, it could also serve as an interconnection point for future high-voltage transmission lines. Therefore, besides avoiding nearby residences, wetlands and archeological features, the site should have adequate nearby corridors for future high-voltage transmission infrastructure, as well as be located near likely future wind development in order to minimize the length of required feeder lines.

More transmission planned; structures capable of future expansion under consideration

Wind turbines can be built more quickly than transmission lines. By the time these two high-voltage lines begin operating—probably sometime in 2007—wind turbine capacity in the area will almost certainly exceed 825 megawatts. So these new lines will be at or near their maximum transfer capacity as soon as they are built. Therefore, utility planners and others are already busy evaluating further transmission needs in the area. (For example, Xcel Energy's ongoing "Buffalo Ridge Incremental Generation Outlet Transmission Study.")

The EQB could order one or both of these transmission lines to have structures that are capable of expansion to higher voltage or multiple circuits in an effort to increase future transmission capacity without using new right-of-way.

However, for the 115-kV line, Xcel Energy does not believe that using structures capable of double-circuiting is advisable because a second line on the same structures would not necessarily result in additional capacity. A second 115-kV line between the new Nobles County Substation and a new Fenton Substation is under serious consideration to increase capacity, but the underlying assumption of that study is that the new line would be on separate right of way. For reliability and operational reasons two 115-kV lines between Fenton and Nobles would

have to be separated by at least a mile or so to use the additional transfer capacity of the second 115-kV line.

Likewise, for the 345-kV line, Xcel Energy's initial analysis indicates that the extra cost (about $7.5 million) of installing structures capable of double circuiting on the I-90 route is not justified because it is not likely that a second 345-kV circuit will be selected along this same route in the future. On the other hand, on the Alliant route, most of the new line would already be constructed as a 161/345-kV double circuit. In that case, the small incremental cost of slightly larger structures, insulators and other improvements needed to be upgraded the 161-kV circuit to a 345-kV circuit in the future may be cost-effective.

Final EIS

Comments on the accuracy and completeness of this draft EIS will be accepted until February 22nd, 2005. Formal comments on the draft EIS should be sent by e-mail or U.S. mail to:

John N. Wachtler
3rd Floor Centennial Building
658 Cedar Street
St. Paul, MN 55155
e-mail: john.wachter@state.mn.us

After the close of the comment period, the EQB staff will prepare a final EIS based on public comments. The final EIS will include revisions to the draft as well as staff responses to comments on the draft EIS.

Public Hearing

The EQB is also required to hold a public hearing regarding the best routes for the proposed lines. Minn. Stat. 116C.57, subd. 2d. The hearings, presided over by a state-appointed administrative law judge, are scheduled for the week of February 28, 2005 in southwest Minnesota. (Details provided in EIS Section 3.7).

Further information

Persons interested in receiving future notices regarding this matter can register their names on the EQB web page www.eqb.state.mn.us or by contacting the public advisor for the project, George Johnson, Environmental Quality Board, 658 Cedar Street, Centennial Building, Room 300, St. Paul, Minnesota 55155, phone (651) 296-2888, e-mail George.Johnson@state.mn.us

Table 1
Summary Comparison of Selected Alternative Routes

Route Option	Length	Transmission ROW (miles)	Roadway ROW (miles)	Total ROW Required (Acres)	Houses <300'	Houses <1000'	# of WMA and WPA w/in 2 miles	# of PWI Waters Crossed	Corners	Costs
345 kV Route Options										
Route 1 Xcel I-90 Route	88.0	19.5	65.3	692.0	5	57	12	28	27	$51,189,117
I-90 W/ Option A (Jackson Co.)	88.0	18.5	62.4	767.2	4	56	15	25	27	$51,826,592
Route 2 Xcel Alliant Route	85.7	67.6	6.7	272.3	12	30	11	23	25	$58,320,072
Alliant W/ Option B (Jackson Co.)	85.2	68.8	8.7	261.3	10	26	11	27	23	$58,549,163
Alliant W/ Option C (Jackson Co.)	84.7	69.8	6.7	214.8	11	33	12	24	21	$58,283,755
115 kV Route Options										
Route E Xcel East	36.6	0.0	35.6	192.3	18	16	18	12	12	$13,417,520
Example East Option B	36.6	0.0	34.6	205.3	15	17	15	13	14	$13,417,520
Example East Option C	37.5	8.5	35.6	153.3	12	16	24	11	14	$15,114,010
Route W Xcel West	36.0	13.5	29.1	128.3	10	12	8	12	17	$15,441,670
Example West A from Sub C	36.0	13.5	30.1	128.3	10	12	8	12	17	$15,441,670
Example West A from Sub A	36.5	13.0	31.2	139.3	12	11	9	12	21	$15,548,680

Substation	Cost
Substation Modifications	
Split Rock	$2,500,000
Lakefield Junction	$1,260,000
Chanarambie	$750,000
New Substation	
Nobles County	$18,000,000
Total Costs	$22,510,000

SECTION 2.0 INTRODUCTION

This section is divided into the following four subsections:

- Section 2.1 Project Purpose
- Section 2.2 Certificate of Need Decision
- Section 2.3 The Project
- Section 2.4 Sources of Information

> *"My greatest hope is that the line will be built and wind energy development will continue to expand throughout Southwest Minnesota. My greatest fear is that we will live to regret it."*
>
> Public comment at scoping meeting, August, 2004.

SECTION 2.1. PROJECT PURPOSE

On June 2, 1994, Minnesota's first commercial wind energy project began operating on Buffalo Ridge near Lake Benton in Southwest Minnesota. Consisting of 73 Kenetech KVS-33 wind turbines, the 25 megawatt project was also one of the first commercial wind projects in the United States outside of California. Now, only a decade later, there are over 700 wind turbines operating on Buffalo Ridge—with an installed capacity of about 580 megawatts (See Figure 1). Many hundred more megawatts of wind energy are possible over the next decade.

Wind development in Southwest Minnesota, however, has outstripped the delivery capacity of the transmission system. Existing transmission infrastructure can currently deliver only a maximum of about 425-megawatts. On windy days, many of the Buffalo Ridge turbines must be shut down, or "curtailed," to prevent overloading the transmission system. This lack of infrastructure is not only restricting use of the existing wind turbines, it is restricting future wind energy development in the area.

In addition, unless there is a major breakthrough in transmission technology, more high-voltage transmission lines will be needed in the future to deliver the increasing amounts of wind power expected on and near Buffalo Ridge. And more lower-voltage lines will be needed to collect the wind energy and feed it into the high-voltage lines. Therefore, the final decision on which route and substation site to select for this project should take into account not only the short-term impacts and costs of a particular alternative, but also its compatibility with long-term plans for continued wind energy development in the area.

SECTION 2.2. PUC NEED DECISION

The Minnesota Public Utilities Commission, after an extensive hearing process, granted Xcel Energy a certificate of need (CON) in March 11, 2003 for four new high-voltage lines in southwest Minnesota. (PUC Docket No.: E-002/CN-01-1958). A summary of the CON order and rationale is

also provided in Xcel Energy's application (hereinafter "Application"). Xcel Energy demonstrated that the transmission system in and around Buffalo Ridge is fully subscribed and more capacity is needed to allow for increased wind generation in that region (Application 8). The approved four transmission lines, with other improvements, will increase wind energy outlet capacity in the area to about 825 megawatts.

This EIS is for two of the four PUC approved transmission lines. For the other two approved lines, the EQB has issued a route permit in September, 2004 for one (161-kV Fox Lake to Lakefield Junction) and the route permit is pending for the other (115-kV Buffalo to White).

SECTION 2.3 THE PROJECT

Xcel Energy has applied to the Environmental Quality Board for one route permit covering two of the new lines approved by the PUC. The larger of the two lines is an approximately 86-mile 345-kV line running from the Split Rock Substation near Sioux Falls, South Dakota east to the Lakefield Junction Substation in Jackson County, Minnesota. The other is a new 115-kV north-south line that will run approximately 40-miles from a new substation near Reading, in Nobles County to the existing Chanarambie Substation in Murray County. The new Nobles County Substation will serve to interconnect the new 115-kV line with the new 345-kV line, and will also likely serve as an important interconnection site for future wind projects. (See Figure 2).

Fenton Substation

Xcel Energy also plans to build a new substation called the Fenton Substation which was discussed as part of the CON process. The Fenton substation will be located about midpoint on the Nobles to Chanarambie 115 kV line. Xcel Energy is coordinating with the large and small wind developers on the siting of this substation and final agreements are not complete at this time. The Fenton substation will be permitted separately (either locally or through the EQB)

South Dakota

The South Dakota portion of the route is included in the application, but has not been finalized. The route described here may change prior to filing the South Dakota application, based on additional input from meetings with landowners and agencies. In addition, the route in South Dakota largely depends on which Route the Minnesota EQB approves.

There are many route segments on each line that can be combined into many combinations of entire routes. Xcel Energy's proposed routes and selected alternative routes are shown in maps in Appendix A. Detailed route segment maps are provided in Appendix B (345-kV line) and Appendix D (115-kV line). A summary comparison of the costs and impacts of selected route alternatives is also provided below in EIS Section 7.

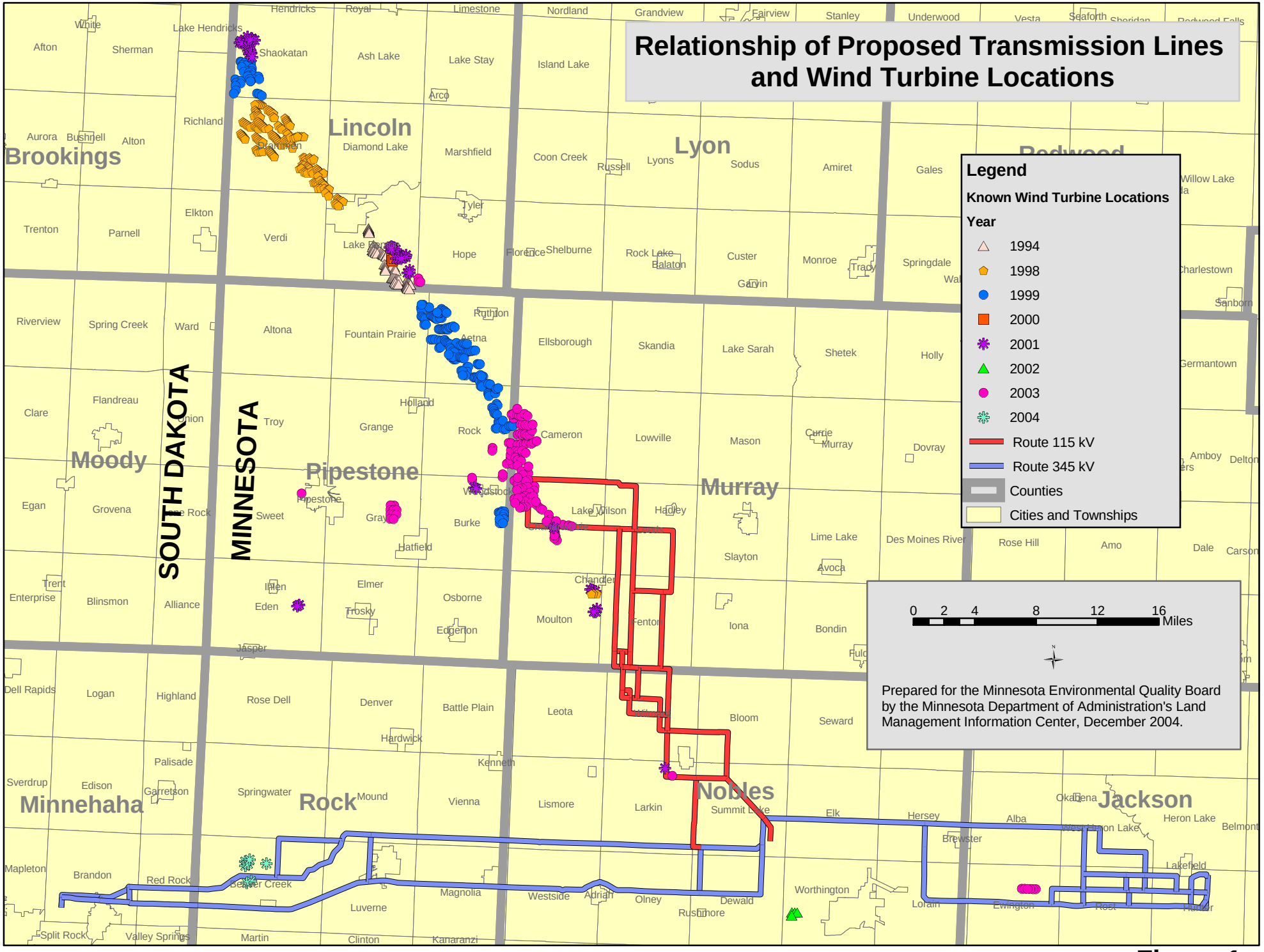
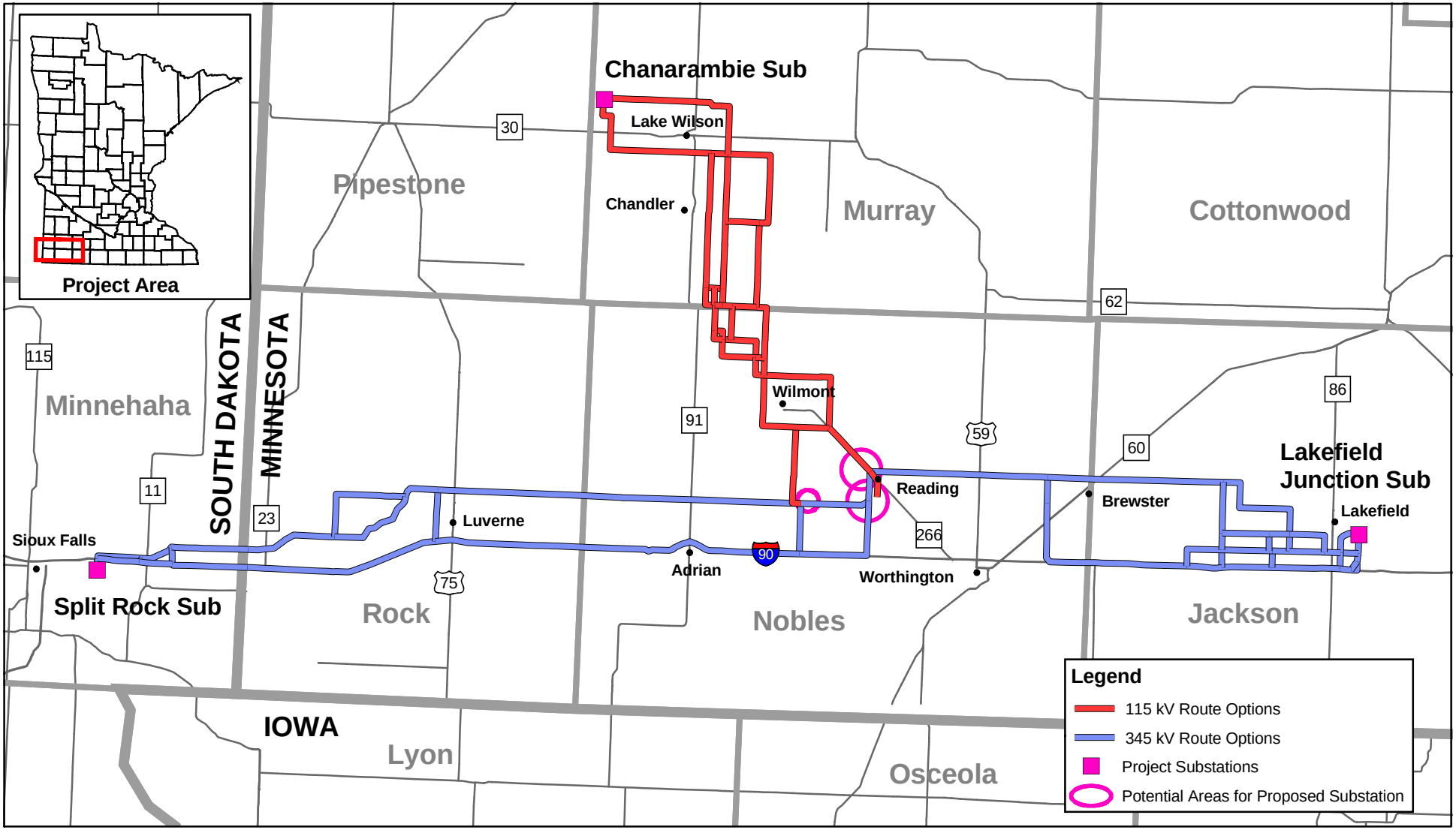

Relationship of Proposed Transmission Lines and Wind Turbine Locations
Legend
Known Wind Turbine Locations
Year
1994
1998
1999
2000
2001
2002
2003
2004
Route 115 kV
Route 345 kV
Counties
Cities and Townships
0 2 4 8 12 16 Miles
Prepared for the Minnesota Environmental Quality Board by the Minnesota Department of Administration's Land Management Information Center, December 2004.
SOUTH DAKOTA
MINNESOTA
Brookings
Lincoln
Lyon
Moody
Pipestone
Murray
Minnehaha
Rock
Nobles
Jackson

Figure 1



Split Rock to Lakefield Junction 345 kV Line
Nobles County to Chanarambie 115 kV Line
Xcel Energy
Windfarm Transmission Improvement Projects

Figure 2

Prepared for the Minnesota Environmental Quality Board by the Minnesota Department of Administration's Land Management Information Center, January 2005.

SECTION 2.4 SOURCES OF INFORMATION

This EIS incorporates by reference, and is primarily based on, analysis and information provided by Xcel Energy in the Application, dated April 30, 2004, and Xcel Energy's responses to a series of fourteen EQB staff information requests (Appendix E).

The scoping decision for this EIS also describes the process used to select potential routes and substation sites under consideration in the EIS and describes the selected routes in detail. The scoping decision is also incorporated by reference.

A complete copy of the Application, the scoping decision, and this draft EIS is available at the following local libraries: Rock County Community Library (Luverne), Adrian Library, Nobles County Library (Worthington), Jackson County Library (Lakefield), Fulda Memorial Library, Slayton Public Library and Chandler City Hall.

The Application and many other documents are also available on the EQB web site (www.eqb.state.mn.us) by clicking on the "Split Rock to Lakefield Junction 345/115 Powerlines" link on the "Pending Energy Permit Applications" list. Or any person may request a copy of the Application by calling the EQB at 651-296-2571.

Any person may also request to have his or her name or an organization's name placed on the project contact list by registering online at the EQB web site (provided above) or by contacting the EQB at 651-296-2571.

In addition to the information provided by Xcel Energy, a list of technical references used in the EIS is provided in EIS Section 9 below.

The EIS is also based on the many comments and ideas provided by many people who live in the project area, including members of the Citizen's Advisory Task Force. EQB staff independently reviewed information provided by Xcel Energy and members of the public by reviewing aerial photographs, by conducting several site visits and by consulting with independent experts.

List of Preparers

EQB staff wrote this draft EIS and is responsible for its accuracy and completeness. Xcel Energy provided technical and cost estimates in their Application, much of which was reviewed and used in the EIS. In addition, Xcel Energy's environmental consultant HDR Engineering, Inc. prepared the Application, provided follow up analysis, and developed the detailed route maps in Appendix B and Appendix D of this EIS.

SECTION 3.0 REGULATORY FRAMEWORK

In Minnesota, most of the larger High-Voltage Transmission Line (HVTL) projects go through a two stage regulatory process. First, application is made to the Minnesota Public Utilities Commission (PUC) for a Certificate of Need (CON). If a CON is granted, the utility must then obtain a Route Permit from the Environmental Quality Board (EQB) that designates a route for the HVTL. This section is divided into the following eleven subsections:

- Section 3.1 Certificate of Need
- Section 3.2 Route Permit
- Section 3.3 Permit Flexibility
- Section 3.4 Scoping Process
- Section 3.5 Public Comments
- Section 3.6 Environmental Impact Statement
- Section 3.7 Public Hearing
- Section 3.8 Other Permits
- Section 3.9 Right-of-Way Acquisition
- Section 3.10 Applicable Codes and Minimum Setbacks
- Section 3.11 Issues Outside EQB Authority

SECTION 3.1 CERTIFICATE OF NEED REQUIREMENT

No new transmission line with a voltage over 200 kilovolts, or over 100 kilovolts with more than ten miles of length in Minnesota, can be constructed in Minnesota without a certificate of need from the PUC. Minn.Stat. §216b.243. Both of the transmission lines being evaluated in this EIS required a CON. The PUC granted the CON on March 11, 2003 in PUC Docket No.: E-002/CN-01-1958.

SECTION 3.2 ROUTE PERMIT REQUIREMENT

Minnesota Statutes § 116C.57 subd 2a states, "Any person seeking to construct a large electric power generating plant or a high voltage transmission line must apply to the board for a site permit or a route permit." High voltage transmission line means "a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kilovolts or more." Minnesota Statutes §116C.52, subd 4. Xcel Energy's proposed transmission lines meet this definition, and the applicant is required to obtain a route permit from the EQB.

EQB's obligation is to choose routes that minimize adverse human and environmental impact while insuring continuing electric power system reliability and integrity, and also while insuring that electric energy needs are met and fulfilled in an orderly and timely fashion. The route permit will contain conditions specifying construction and system operational standards. An example of a recent EQB route permit for the 161-kV line between Fox Lake and Lakefield Junction substations is attached in EIS Appendix F.

SECTION 3.3 ROUTE PERMIT FLEXIBILITY

Under the Minnesota Power Plant Siting Act, a "route" may have a variable width of up to 1.25 miles. Minn. Stat. §116C.52, subd. 8. In this case, Xcel Energy has requested a route width of 660 feet on each side of a center line for most areas in order to allow flexibility during final design. Xcel has also requested a wider route in some areas near substations that are already congested with lower voltage lines. Providing this flexibility allows Xcel Energy to get input from landowners on detailed design issues such as pole placement.

However, for some areas along the designated route, the EQB can and may limit the new power line to a more specific, narrow route in order to ensure protection of sensitive areas or in response to specific landowner concerns. The EQB can also designate a wider corridor in order to allow more flexibility where needed. The EQB staff identified areas where a more specific route may be specified in the route permit in EQB Information Request No. 10 to Xcel Energy. Xcel Energy's response to this Information Request is provided in Appendix E.

There are also several areas where EQB staff has suggested that the allowed route should be greater than 660 feet on each side of the centerline in order to allow needed flexibility in final design. These areas are also described in Section 4.6.

SECTION 3. 4 EIS SCOPING PROCESS

The proposed project involves a new transmission line over 200 kilovolts, so the EQB is required to prepare an environmental impact statement (EIS) on the human and environmental impacts of the preferred route and potential alternatives. Minn. Stat. §116C.57.

The first step in preparation of an EIS for a transmission line is to review the applicant's analysis. Xcel Energy's evaluation process used to select potential routes for the 345 kV and 115 kV transmission lines are outlined in Sections 4.1 and Section 6.1 of the Application. Then additional potential routes and impacts are identified based on suggestions and proposals from local citizens. The Chair of the EQB added additional routes and route segments to consider in the final permit decision. The selected routes added for further consideration and the process used to select them are described in the scoping decision for this project, dated September 24, 2004.

SECTION 3. 5 PUBLIC COMMENTS DURING SCOPING PROCESS

Copies of the comment letters received during the scoping period are attached to the EIS Scoping Decision Document and can be found on the EQB website at www.eqb.state.mn.us/Docket.html?Id=6466.

In addition to numerous comments about specific route issues, during the scoping period the public expressed the following major concerns or opinions about this project (from scoping document):

Landowner Compensation

1. Utilities should not be allowed to use eminent domain for transmission projects that are primarily needed for economic or environmental reasons, such as for wind-energy development. Eminent domain should be reserved only for transmission projects that are truly needed for a legitimate public purpose; that is, that are required to meet minimum reliability and local needs.
2. If allowed to use eminent domain, current utility compensation to landowners is unfair, given the amount of disruption to farming operations;
3. Instead, compensation to landowners for wind-energy related transmission lines should be tied to wind-energy production, not market-value of the land.

Wind-Energy Potential

4. The EIS should assess which transmission line routes and substation sites maximize future wind development opportunities, primarily by minimizing the distance and costs required to interconnect likely wind-projects into the new transmission;
5. Substation sites in particular should be evaluated based on how close they are to areas of high wind-development potential, with priority given to locally-owned wind project areas;

Human Health and Environment

6. The EIS should consider the potential health effects of magnetic fields and problems with stray voltage;
7. The EQB should not allow any new high-voltage transmission line to come within 300 feet of any occupied residence;
8. The EIS should provide more detailed information on minimum electric codes and required distances from homes and buildings;
9. Routes should be evaluated based on whether they can avoid tree groves;
10. Impacts on wetland and wildlife management areas should not be weighted more than impacts on people. Other comments, however, focused on minimizing impacts on waterfowl and other wildlife, particularly near South Heron Lake in Jackson County;
11. The EIS should recognize that big transmission lines are ugly; and evaluate routes based on how well they minimize visual impacts.

Long-Term Transmission Plans

12. The EIS should recognize that more high-voltage transmission lines and substations will be needed in the near future because of expected increases in wind-energy development in Southwest Minnesota. Therefore:
    (a) the EQB should seriously evaluate whether the proposed transmission lines should be built to be capable of expansion to a higher voltage in the future; and

(b) routes and substation locations should be evaluated based on future transmission requirements for the area as a whole, not just for this project;

13. The EIS should evaluate and the EQB should consider the project-specific and cumulative impacts—both positive and negative—of wind-energy development on Buffalo Ridge as a place to live (local landowners) and on Buffalo Ridge as a historical and tribal resource (State Historical Preservation Office). More specifically, the EIS should evaluate how best to minimize negative impacts of continued wind-energy development in general on views, noise, and traffic so the Buffalo Ridge area can retain its value as a historical resource and as a rural farming community.

14. Substation site comparisons should include an analysis of the likely negative impacts on nearby areas due to future feeder and high-voltage transmission lines crossing through the area to connect into the substation;

Impacts on Agriculture

15. The EIS should evaluate routes based on whether they stay out of farm fields and avoid splitting farms and otherwise disrupting operations;

16. The EIS should evaluate whether on routes along roadways (including I-90 and township and county roads), the utility poles can be put within the existing road right-of-way instead of five feet into fields in order to minimize impact on prime farmland and farm operations;

Local Government Liability

17. Local government believes that the EIS should assess, and the EQB should consider, the considerable indirect economic impact on local government of allowing the utility to place new power poles just outside existing road right-of-way. According to comments, under current law if a roadway must be widened, the utility must pay the high cost of relocating the poles when they are within existing road right-of-way. However, if the poles are just outside the existing right-of-way, the local unit of government must pay to relocate them. Specifically, Nobles County requests that the EQB require any new transmission line poles along roadways to be installed either within the existing right-of-way where it is safe to do so, or require that the poles be placed at least 100 feet from the edge of the existing right-of-way.

SECTION 3.6 ENVIRONMENTAL IMPACT STATEMENT

Draft EIS

Public comments will be accepted on the accuracy and completeness of this draft EIS until February 22, 2005. Comments on the draft EIS should be sent to:

John N. Wachtler
3rd Floor Centennial Building
658 Cedar Street
St. Paul, MN 55155
e-mail: john.wachter@state.mn.us

Final EIS

After the close of the comment period on the draft EIS, the EQB staff will prepare a final EIS based on public comments. The final EIS will include revisions to the draft as well as staff responses to substantive comments on the draft EIS.

SECTION 3.7 PUBLIC HEARING

The EQB is required by Minnesota Statutes § 116C.57 subd 2d to hold a public hearing once the EIS has been completed. This hearing will be held in the following locations:

- Lakefield Senior Citizen Center, 112 South Main Street, March 1, 2005
- Wilmont Community Center, 316 4th Avenue March 2, 2005
- Luverne Rock County Library, 201 West Main Street, March 3, 2005
- Chandler City Center, 241 4th Street, March 4, 2005

There will be an afternoon session and an evening session at each location. The afternoon session will convene at 2:00 p.m. and the evening session will convene at 7:00 p.m.

The hearings will be conducted by Administrative Law Judge (ALJ) Allan W. Klein. Details about the place and time of the hearing can be found online at http://www.eqb.state.mn.us/Docket.html?Id=6466.

At the hearing, anyone can provide comments regarding why a particular route or route segment should be selected by the EQB for the route permit. Persons may testify at the hearing without being first sworn under oath. The ALJ shall ensure that the record created at the hearing is preserved and transmitted to the board. The ALJ will prepare a report that will include proposed findings of fact and conclusions and a recommendation on routes.

A final decision on a route permit will be made by the EQB Board at an open meeting within a couple of months after the public hearing, depending on scheduling opportunities.

SECTION 3.8 OTHER PERMTS

Below is a summary of the approvals that Xcel Energy will have to acquire prior to construction. Detailed information about each permit can be found in Section 7.3. (From pp. 158-161) of the Application.

Permit	Jurisdiction
Local Approvals	
Road Crossing Permits	County, Township, City
Lands Permits	County, Township, City
Building Permits	County, Township, City
Over-width Loads Permits	County, Township, City
Driveway/Access Permits	County, Township, City
State of Minnesota Approvals	
Route Permit	EQB
Utility Permit (highway crossings)	MN/DOT
License to Cross Public Waters	MN-DNR Division of Lands and
Public Waters Work Permit	MN-DNR Division of Waters
NPDES Permit	MPCA
401 Water Quality Certification	MPCA
State of South Dakota Approvals	
SD PUC Permit	SD PUC
Permit to Occupy ROW	SD Department of Transportation
NPDES Permit	SD Department of Environment and Natural Resources/Surface
Possible Federal Approvals	
Section 404 (Dredge and Fill)	U.S. Army Corps of Engineers

SECTION 3.9 APPLICABLE CODES AND MINIMUM SETBACK REQUIREMENTS

The transmission lines, regardless of route, must meet all requirements of the National Electric Safety Code (NESC), as published by the Institute of Electrical and Electronics Engineers, Inc. (IEEE), and approved by the American National Standards Institute (Minn. Stat. §326.243 and Minn. Rules part 7826.0300, Subp. 1). A summary of the applicable standards are provided below in Table 2 and Table 3.

These standards are designed to protect human health from shocks or related electrical problems. They also ensure that a transmission line and all associated structures are built from high quality materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment provided normal routine operation and maintenance are performed.

The NESC covers electric supply stations and overhead and underground electric supply and communication lines, and is applicable only to systems and equipment operated by utilities or similar systems on industrial property.

Xcel Energy stated in the Application that it would comply with local, state, NESC, and Xcel Energy standards regarding the installation of facilities, clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials, and right-of-way widths. Xcel Energy has initiated more conservative clearances than the NESC requirements in cases where needed to protect their facilities from damage. Some clearances are also mandated by the Minnesota Department of Transportation (Mn/DOT).

Frequently asked questions about the NESC standards are available on the IEEE website at: http://standards.ieee.org/faqs/NESCFAQ.html.

Xcel Energy has committed to adhering to these standards for all of the proposed alternatives. No conflicts are anticipated, since horizontal clearances for buildings will be exceeded by the necessary ROW for a majority of the project. Along segments T7, T10, and T12 there are four locations where farm outbuildings are potentially within the proposed ROW (See Appendix B). In practice, Xcel Energy does not allow buildings or other tall structures such as grain bins within their ROW. As described below, the ROW proposed for the 345 kV line is 75 feet and 37.5 feet for the 115 kV line measured from either side of the structure.

Table 2

NESC and Xcel Energy Clearances for 345 kV Transmission Lines

Condition	NESC minimum clearance to conductor	Xcel Energy design minimum clearance to conductor
Roads, streets, agricultural lands, forests traversed by vehicles	24'-9" (vertical)	34' (vertical)
Water areas not suitable for sail boating	23'-3" (vertical)	34' (vertical)
Water areas suitable for sail boating – 20 to 200 acres	39'-9" (vertical)	40' (vertical)
Water areas suitable for sail boating – 200 to 2000 acres	45'-9" (vertical)	46' (vertical)
Building roofs not accessible to pedestrians	18'-9" (vertical)	No buildings allowed in easement
Building roofs accessible to pedestrians	19'-9" (vertical)	No buildings allowed in easement
Building walls, projections, balconies	10'-9" (horizontal)	13'-9" horizontal from conductor blowout No buildings allowed in easement.
Grain Bin vertical clearance	18' above highest fill point	No grain bins allowed in easement
Grain Bin horizontal clearance	Highest bin height + 18'	No grain bins allowed in easement Highest bin height + 18' horizontal clearance
Tree vertical clearance	No specific requirement	20' vertical 15' maximum mature height of trees within easement No trees within 25' of structures or within maintenance access roads
Tree horizontal clearance	No specific requirement	13'-9" horizontal from conductor blowout 15' maximum mature height of trees within easement No trees within 25' of structures or within maintenance access roads

Table 3
NESC and Xcel Energy Clearance for 115 kV Transmission Lines

Condition	NESC minimum clearance to conductor	Xcel Energy design minimum clearance to conductor
Roads, streets, agricultural lands, forests crossed	20'-1" (vertical)	25' (vertical)
Water areas not suitable for sail boating	18'-6" (vertical)	25' (vertical)
Water areas suitable for sail boating – 20 to 200 acres	30'-1" (vertical)	31' (vertical)
Water areas suitable for sail boating – 200 to 2000 acres	36'-1" (vertical)	37' (vertical)
Building roofs not accessible to pedestrians	14'-1" (vertical)	No buildings allowed in easement
Building roofs accessible to pedestrians	15'-1" (vertical)	No buildings allowed in easement
Building walls, projections, balconies	6'-1" (horizontal)	9'-1" horizontal from conductor blowout No buildings allowed in easement.
Grain Bin vertical clearance	18' above highest fill point	No grain bins allowed in easement
Grain Bin horizontal clearance	Highest bin height + 18'	No grain bins allowed in easement Highest bin height + 18' horizontal clearance
Tree vertical clearance	No specific requirement	15' vertical 15' maximum mature height of trees within easement No trees within 25' of structures or within maintenance access roads
Tree horizontal clearance	No specific requirement	9'-1" horizontal from conductor blowout 15' maximum mature height of trees within easement No trees within 25' of structures or within maintenance roads

SECTION 3.10 RIGHT OF WAY AQUISITION, EMINENT DOMAIN

The EQB is not directly involved in utility land acquisition. However, once the EQB issues a route permit the utility is authorized to begin easement negotiations and use its power of eminent domain, if necessary. As described in more detail in the Xcel Energy Application (Application, Section 3.3), after the EQB route permit and other approvals to construct the Project are secured, Xcel Energy will initiate contact with landowners to start the survey for the new line. Xcel Energy's Land Rights Agents will work with the landowners at an early stage to answer questions about the project and to obtain permission for route surveys and soil investigations prior to construction. As the design of the line is further developed, contacts with the owners of affected properties will continue and the negotiation and acquisition phase will begin for Xcel Energy to obtain the necessary land or easement rights for the facilities. For more information on the right-of-way process, contact the Xcel Energy project manager listed on the EIS title page, or click on "Xcel's Right-of-Way Acquisition Handout" on the EQB web site for this project.

SECTION 3.11 ISSUES OUTSIDE EQB AUTHORITY

There are some important issues raised in public comments that are outside EQB authority or the scope of this specific project. First, the EIS evaluates potential local government liability for future pole relocation costs, but does not evaluate the policy issues regarding whether local government or utilities should pay for utility-pole relocation. Likewise, the EIS does not evaluate landowner compensation because the issue is outside EQB authority. The EIS does not evaluate the cumulative impacts of wind development on Buffalo Ridge as a historic and cultural resource because this broad issue is outside the scope of the impacts of this specific project. Nor will the EIS evaluate whether a different size or different type of transmission line should be built instead of that which the applicants have proposed. The EQB will not consider other endpoints than approved in the PUC certificate of need order, or the relocation of existing transmission lines. The EQB will not consider the no-build option.

SECTION 4.0 TRANSMISSION STRUCTURES AND ROUTES

This section of the EIS is divided into the following seven subsections:

- Section 4.1 Structure Design
- Section 4.2 345-kV Route Alternatives
- Section 4.3 345-kV Route Segments
- Section 4.5 115-kV Route Alternatives
- Section 4.6 115-kV Route Segments
- Section 4.7 Substation Site Alternatives

SECTION 4.1. STRUCTURE DESIGN

345-kV Line

In general, to minimize farming conflicts and reduce visual impacts, Xcel Energy has proposed using steel single-pole structures wherever feasible, instead of less expensive but more intrusive wooden H-frame supports or other alternative structures. For the 345 kV transmission line, Xcel Energy has proposed using single pole, single circuit, galvanized steel, davit arm structures for routes that follow new right-of-way (ROW). The proposed structures would be about 120 to 140 feet tall, with average spans of about 950 feet (Figure 3). For routes that follow existing transmission line ROWs, Xcel Energy is proposing single pole, double circuit, galvanized steel, davit arm structures will be utilized to the extent possible (Figure 4). The specifics on the engineering design, construction methods, and ROW requirements are included in the Application in Sections 3.1.1.1 and 3.3.

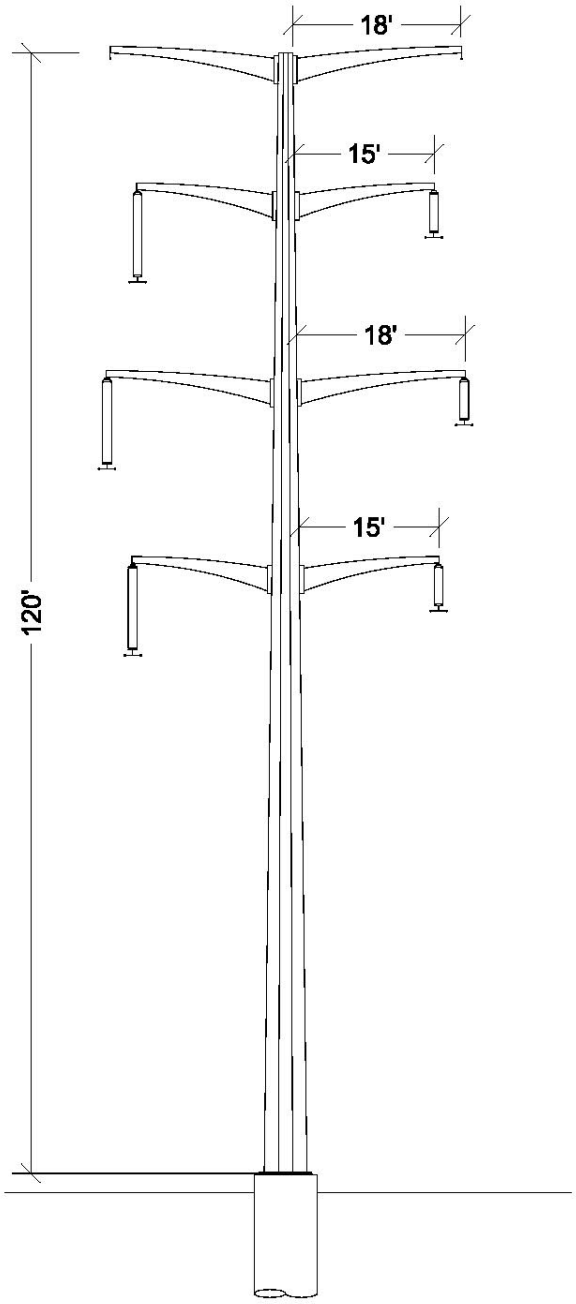
115-kV Line

For the 115-kV transmission line, Xcel Energy is proposing single pole, double bundled single circuit, galvanized steel, davit arm structures for a majority of the route. The poles would be about 70 to 80 feet tall, with average spans of about 400 feet. Other structure types may be necessary in some areas, such as near waterfowl areas or interstate crossings. Areas where there are existing 69 kV structures, single pole, double circuit, galvanized steel, davit arm structures are proposed to the extent practicable. Some sections of the new 115 kV transmission line will include provisions for a 34.5 under build, primarily near Xcel Energy's Chanarambie, Nobles County and Fenton substations, where numerous lines enter and exit the substation. Xcel Energy's proposed structures for the 115-kV line are represented in Figures 5 and 6. The engineering design is described in detail in Section 3.1.1.2 of the Application. Construction methods and ROW requirements are also discussed in Section 3.3 of the Application.

SECTION 4.2 345-KV ROUTES ALTERNATIVES

The primary method for limiting the impacts of new high-voltage transmission lines is to maximize the use of existing rights-of-way: roads, highways, railroads, and other existing high voltage

FIGURE 3
DOUBLE CIRCUIT 345/115KV



Double Circuit 345kV/115kV

FIGURE 4
DOUBLE CIRCUIT 345/161KV

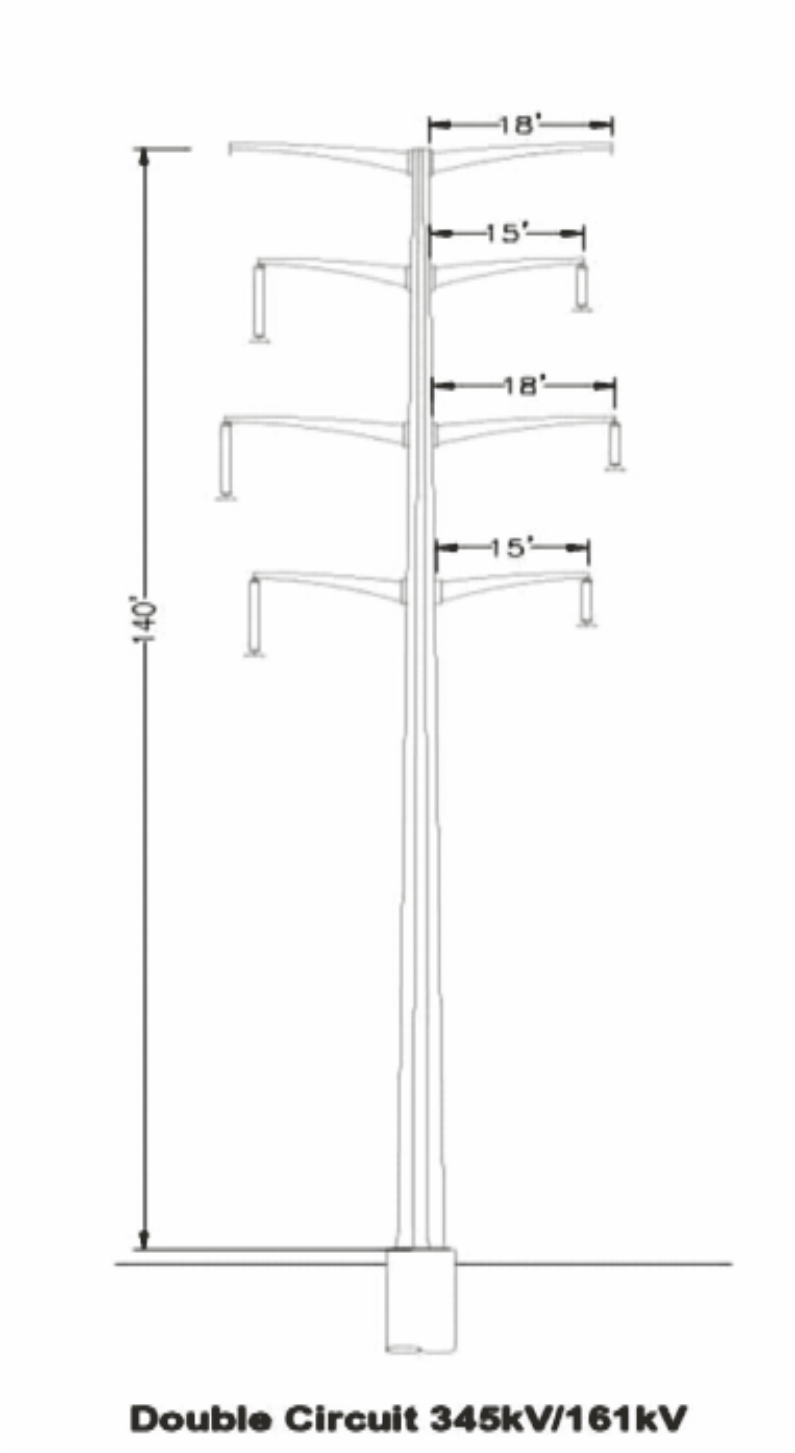
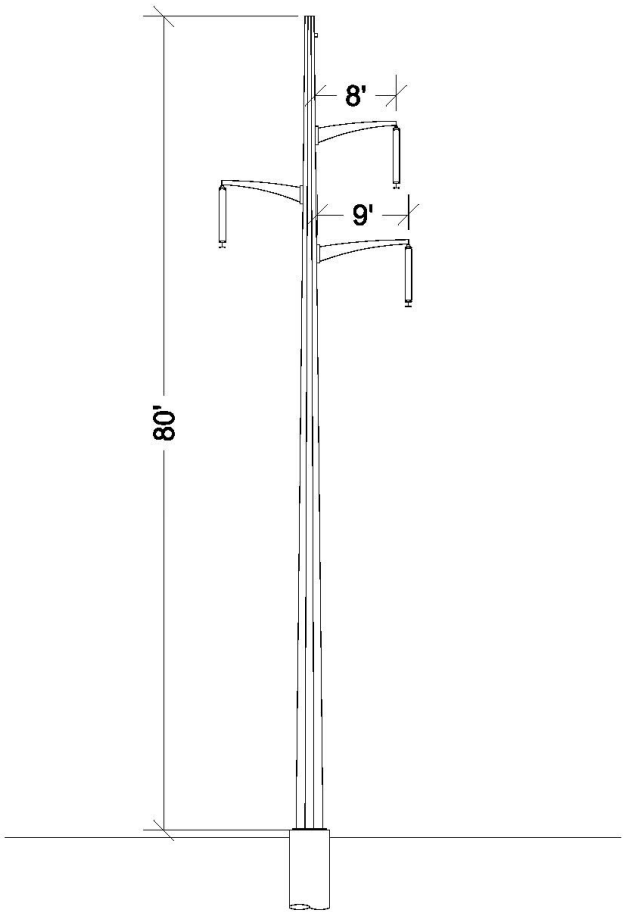
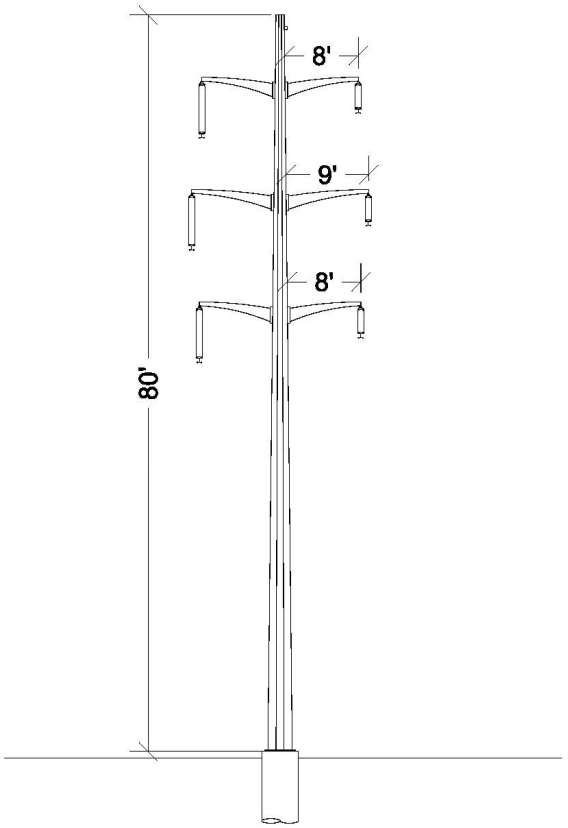


FIGURE 5
115 KV SINGLE CIRCUIT



Single Circuit 115kV

FIGURE 6
DOUBLE CIRCUIT 115/69 KV



Double Circuit 115kV/69kV

transmission lines. For the proposed 345-kV transmission line, there are two such potential routes: (1) along Interstate Highway I-90, and (2) on an existing 161-kV transmission line running two to five miles north of, and parallel to, I-90. The second route is often referred to as the "Alliant" route because most of the existing line is owned by Alliant Energy.

There is also a separate 161-kV line owned by Alliant Energy in Jackson County that could be used for corridor sharing near the Lakefield Junction Substation using either route.

Appendix A contains overview maps of all route segments under consideration for the 345-kV line. Appendix B contains detailed maps of each route segment map on aerial photographs. The overview maps in Appendix A also include references to the corresponding underlying detailed map included in Appendix B. Figures A1 through A3 show Xcel Energy's preferred route along I-90 and the alternative route using the existing 161-kV transmission line. Figures A4 and A5 illustrate three other possible routes through Jackson County, where new right-of-way may be required to connect the line into the Lakefield Junction Substation.

Xcel Energy's Preferred Route 1: I-90 Route

This 88-mile route is Xcel Energy's preferred route. The route generally parallels Interstate 90 (I-90) but deviates north near the city of Worthington to connect with the new Nobles County Substation and avoid the Worthington airport. The route continues east from the chosen substation location to the Lakefield Junction Substation, east of Lakefield, where part of the route shares right-of-way with an existing 161-kV transmission line owned by Alliant Energy. This route option will cost approximately $51 million

The Application (p. 104) describes Xcel Energy reasons for preferring the I-90 route, which are primarily lower cost, faster construction time, and less completely new right-of-way required.

Xcel Energy Alternative Route: Alliant Route

This 86-mile route will primarily double circuit sections of the existing Xcel Energy and Alliant Energy 161 kV transmission lines, beginning just north of the Split Rock Substation. However, it will also require some new ROW that is not along an existing corridor. New ROW is required where the existing 161 kV line turns north to the Heron Lake Substation about 7 miles west of the Lakefield Junction Substation. This route option will cost approximately $58 million.

Other 345 kV Route Alternatives

There are over 45 route segments under consideration for the 345-kV line, and three Nobles County Substation sites under consideration. These segments and substation site options can be combined in many ways to develop the best 345-kV route. Other than in Jackson County and one route segment in Rock County, most of the 345-kV route segments either follow I-90 route or the Alliant route. Importantly, however, the final route could also be a combination of these two main route options using "crossing" route segments.

The 345-kV route segments under consideration are described in the next section. Data comparing all 345-kV route segments, as well as a comparison of selected routes are provided below in Section 7.

SECTION 4.3 345-KV ROUTE SEGMENTS

The only route segment Xcel Energy proposed but is not being considered in the EIS is most of Segment I7, which ran east-west to the north of Worthington. However, a small section of I7 may be necessary for the 115-kV line if Substation Site B is selected by the EQB. The rest of I7 was excluded from further consideration in the EIS because it required new right-of-way, and the alternative route along the existing 161-kV line transmission is available. (See EIS Scoping Decision).

I-90 Route Segment Descriptions

This information is from the Application (p. 55-57)

Segments included in the I-90 route to and from Substations A and B include: I1, I2, I3, I4, I5, I6, T9, T10, C5, I8, I9, C7, T14, T15, and TI1. If Substation C were chosen, segments C4 and T8 would be added and segment I6 would be removed from the route described above. The South Dakota portion of the route is included in the application, but has not been finalized. The route described here may change prior to filing the South Dakota application, based on additional input from meetings with landowners and agencies. In addition, the route in South Dakota largely depends on which Route the Minnesota EQB approves.

Below is a description of the route by segment starting on the western end of the route.

I1 begins at the Split Rock Substation in South Dakota. The line exits the substation north, crossing the Big Sioux River west of Brandon. The line will cross I-90 and will follow the north side of the Interstate for approximately three miles. Segment I1 ends 2400 feet west of Highway 11 in Brandon, SD.

I2 is two miles long and follows the north side of the Interstate. The transmission line will likely cross through the intersection at Highway 11 and I-90, north of Brandon. It will continue east, crossing Split Rock Creek, and following interstate ROW adjacent to agricultural fields for 2.5 miles.

I3 begins 2.5 miles east of 486th Street. Continuing east, the transmission line will cross to the south side of the interstate at the beginning of I3. It will then follow the Interstate ROW passing through farm fields, until the Minnesota and South Dakota state border. Approximately 2900 feet from the border, the line will likely deviate south following the edge of the Minnesota Rest Area and Beaver Creek Travel Information Center.

I4 begins at the Minnesota and South Dakota Border. The line will continue east along the south side of the interstate, passing Springwater Creek just east of the junction of I-90 and T.H. 23. The transmission line will cross through this intersection, following the interstate for two miles where it crosses Beaver Creek. The town of Beaver Creek is just past the intersection of CSAH 4 and I-90. The transmission line will likely be routed through this intersection as well as the intersection of

CSAH 6 and I-90 east of Beaver Creek. The line continues east toward Luverne, crossing small, farmed drainages and agricultural land. This segment ends just east of Luverne, two miles east of CSAH 11 near the Golden Plump facility and the 115 kV line west of Luverne.

I5 begins at the 115 kV line that runs north-south on the west side of Luverne. Along the south side of the Interstate, the line will cross areas near businesses associated with highway services. The line will then continue east, crossing the Rock River east of Luverne. Approximately four miles east of Luverne, the line will cross Elk Creek, and will continue east crossing through the intersection of CSAH 3 and I-90 near Magnolia. One mile east of Magnolia, the line will cross from Rock County into Nobles County. Approximately 4.5 miles east of Magnolia, the line will deviate south slightly to avoid impacting the Adrian East Rest Area, west of Adrian. It will cross Kanaranzi Creek, and just past the 69 kV line west of Adrian, the line will switch to the north side of the interstate to avoid impacting resources in Adrian. The line can double circuit with the 69 kV line to avoid the intersection of T.H. 91 and I-90. Once past the intersection, the line will continue east as a single circuit line, along the northern edge of the highway ROW, for 5.5 miles. I5 ends at segment C4, where the line would deviate north for three miles to reach Substation C, if that substation site was chosen. Otherwise, the route would continue along the northern edge of the interstate along I6.

I6 begins approximately 2500 feet west of CSAH 13. The line will deviate north to avoid the intersection of CSAH 13 and I-90, since there is not much room for poles to be placed in this intersection. The line will continue east along the north side of the highway ROW on agricultural land, and 1.5 miles east of County Road 61, the line will be routed around Worthington, MN due to siting concerns related to the airport and the need to connect with the Nobles County Substation near Reading, MN. I6 goes north toward Substations A and B for approximately 3.2 miles along the half section west of CSAH 9. At this point, I6 meets Substation B.

T9 begins at the Substation B location along the half section west of CSAH 9 where it will begin double circuiting with the existing 161 kV transmission line. This segment of the route is 1.7 miles long and crosses CSAH 14, near Reading, Minnesota, one mile north of the Substation B site. The line continues north, crossing an old railroad bed and T.H. 266. Northeast of Reading, near T.H. 266 is the location of Substation A. It is at this location where the Interstate Route continues east to avoid Worthington.

T10 continues east following the existing 161 kV ROW north of Reading. The line currently crosses agricultural land along the half section south of 190th Street. The line is approximately 2.9 miles north of the Worthington Municipal Airport and follows the Alliant Route for 10.5 miles. Along T10, the line will cross Judicial Ditch 8, Elk Creek, and three unnamed tributaries of Elk Creek. This segment ends at Town Avenue.

C5 follows Town Avenue south for one mile. The Interstate Route will continue south to meet up with the Interstate. Along C5, the line will follow the east side of the road to avoid a residence on the west side of the road.

I8 begins at the junction of Town Avenue and CSAH 14. The line will follow the east side of the road for 4.5 miles. The line will cross T.H. 60, southwest of Brewster. Just south of T.H. 60 Town Avenue becomes a minimum maintenance road for approximately one mile. After crossing CSAH 18, the line becomes Town Avenue/County Road 3 for 1.5 miles until it reaches I-90. To avoid the home at I-90 and County Road 3, after crossing Okabena Creek the line will cross a farm field

southeast, and will meet the north side of I-90 approximately 1400 feet east of the intersection of County Road 3 and I-90. I8 will continue east along the north side of I-90, crossing the CSAH 1 at the Nobles and Jackson County border. After crossing the county border, the line will continue east 7.5 miles, crossing CSAH 5 and CSAH 9 and many agricultural fields, ending 0.5 miles east of CSAH 9.

I9 continues along the north side of I-90. It will cross a large wetland complex that is associated with the Little Sioux River. This section of the route is approximately three miles long.

C7 is a one-mile segment along the half section west of 42nd Avenue that brings the line north. The line deviates one mile north to avoid the Summers WMA and the Nauerth airstrip, which are located south of the route near I-90. The line will likely double circuit with the 161 kV transmission line that comes north from Wisdom. The line crosses County Ditch 11 approximately 2000 feet north of I-90. The segment ends at the existing Alliant Line where it will continue east toward Lakefield Junction Substation.

T14 is the segment where the line turns east for four miles, and ends 0.5 miles east of T.H. 86. The line double circuits with the existing Alliant ROW through agricultural fields. The line crosses County Road 7, County Road 67 and T.H. 86. As the line crosses T.H. 86, it runs adjacent to local Lakefield businesses. This segment ends approximately 0.5 miles east of T.H. 86.

T15 and TI1 are the segments used to enter the Lakefield Junction Substation. T15 continues along the existing Alliant Line, double circuiting the entire 2.2 miles across agricultural fields and an unnamed intermittent stream. TI1 begins 0.5 miles east of 460th Avenue and will double circuit with the existing 161 kV transmission line that currently enters the Lakefield Junction Substation from the south. This segment is approximately 1.1 miles and follows the existing transmission line corridor that is present south of the Lakefield Junction Substation.

Alliant Route Segment Descriptions

The Alliant Route is an 85.7-mile transmission line that will use single steel pole structures that would double circuit with the existing transmission line. Approximately 10.1 miles of the route is in South Dakota; the remaining 75.6 miles is in Minnesota and is the portion of the Alliant Route that is being considered for this application. It has been broken up into the following segments: T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T13, T14 and MF1. The route will be the same no matter which substation site is chosen.

Below is a description of the Alliant Route by segment, starting on the western edge of the route:

T1 begins at the Split Rock Substation in South Dakota. The line exits the substation north, crossing the Big Sioux River and I-90, where it joins the existing 115 kV transmission line, which is approximately 1000 feet north of the interstate. This segment will double circuit with the 115 kV transmission line for approximately 3,500 feet. At this point the line will convert to single circuit structures for the remainder of the segment. This segment is approximately 2.7 miles long and ends 1600 feet west of Highway 11 just south of Corson, SD near the railroad tracks.

T2 begins at the railroad tracks west of Highway 11. It continues east double circuiting with the existing 161 kV transmission line, where it crosses Highway 11 and Split Rock Creek. Once crossing Split Rock Creek, the line turns northeast following the existing line through agricultural

fields. The line ends approximately 2.5 miles east of 486th Street, where the 345 kV line goes north to the White Substation. The segment is approximately two miles in length.

T3 follows the half section line north of 260th Street. The segment is approximately 4.5 miles long and double circuits with the existing 161 kV line through agricultural fields to the South Dakota/Minnesota border.

T4 begins at the state border. The line will continue to double circuit in a northeasterly direction, crossing T.H. 23. Approximately 2000 feet west of County Road 59, the line heads due east and ends at CSAH 6.

T5 deviates north from the existing 161 kV transmission line, since it currently follows a streambed northeast to 131st Street. Instead of following the current route, Xcel Energy proposes to remove the existing line that follows the streambed and instead build a new double circuit north along CSAH 6 for approximately 2.5 miles on the east side of the county highway ROW. The line will avoid the Rock County Reservoir and associated facilities on the east side of the road. At 131st Street, the line will continue as a double circuit line east for 4.1 miles until it reaches the existing 161 kV route, just past CSAH 11/100th Avenue.

T6 will begin just past CSAH 11, where the existing 161 kV transmission line crosses 131st Street. At this point, the 345 kV transmission line will continue to double circuit along the existing route, northeast for approximately 3000 feet, where it heads east through farm fields along the half section line north of 131st Street. One mile after crossing 110th Avenue, the segment will end where the existing 115 kV transmission line crosses the existing 161 kV transmission line.

T7 begins where the existing 115 kV line crosses the existing 161 kV line northwest of Luverne. The line crosses through farm fields, Rock River, and Elk Creek, approximately 0.5 miles south of Blue Mounds State Park for nine miles, until it reaches the Rock and Nobles County Border. Once in Nobles County, the line continues east through farm fields crossing several farmed drainages and streams for thirteen miles. Near Jones Avenue, the line will reach the site for Substation C.

T8 begins 2700 feet west of Jones Avenue and the proposed site for Substation C. Regardless of whether this substation site is chosen, the line will double circuit along T8, crossing agricultural land for approximately four miles. This segment ends at the site for Substation B.

T9 begins at the Substation B location along the half section west of CSAH 9. This segment of the route is 1.7 miles long and crosses CSAH 14, near Reading, Minnesota one mile north of the Substation B site. The line continues north, crossing an old railroad bed and T.H. 266. Northeast of Reading, near T.H. 266 is the location of Substation A.

T10 follows the existing 161 kV ROW north of Reading. The line currently crosses agricultural land along the half section south of 190th Street. The line is approximately 2.9 miles north of Ditch 8, Elk Creek, and three unnamed tributaries of Elk Creek. This segment ends at Town Avenue.

T11 continues double circuiting with the 161 kV line for three miles, where it crosses T.H. 60, just north of Brewster, Minnesota. At the Nobles and Jackson County border in Brewster, the line will abut a newly constructed substation and soybean processing facility. Once in Jackson County, the line will continue double circuiting for 7.5 miles, crossing Okabena Creek, ending 0.5 miles west of 390th Avenue.

T12 begins where the existing 161 kV line heads north to Heron Lake, 0.5 miles west of 390th Avenue. The line will turn south and will single circuit along the half section line for four miles. The line will cross agricultural fields and Judicial Ditch 3, a farmed drainage north of 820th Street. The line will end 0.5 miles north of CSAH 12/800th Street.

T13 directs the line east, single circuiting along the half section north of CSAH 12/800th Street. The line crosses a large wetland designated as a WPA west of 400th Avenue. The line will end 0.5 miles west of 42Xth Avenue.

T14 will double circuit with the 161 kV transmission line that comes from Wisdom and heads east 0.5 miles north of CSAH 12. The line crosses agricultural fields, County Road 7, Country Road 67, and T.H. 86. As the line crosses T.H. 86, it runs adjacent to local Lakefield businesses. This segment ends approximately 0.5 miles east of T.H. 86.

MF1 is the segment that the Alliant Route will enter the Lakefield Junction Substation. A landowner in the area suggested this segment. It begins at the half section east of T.H. 86, and continues north through an agricultural field for 4600 feet, which is just south of 9th Avenue South. At this point the turns northeast, crossing 9th Avenue South and 460th Avenue. Approximately 900 feet north of the intersection of 9th Avenue and 460th Avenue, the line heads due east toward the Lakefield Junction Substation.

Crossing Route Segments

These route segments were not included but not described in the Application.

C1 is approximately 0.28 miles long and would double circuit with an existing 161 kV transmission line 2400 feet west of Highway 11 in Brandon, SD. This segment would connect segments I1 and T2.

C2 is approximately 0.97 miles long and would double circuit with the existing 345 kV line. This segment would connect segments I2 and T3.

C3 This segment is a 3.06 mile segment that would run along the western edge of Luverne. The segment would double circuit with an existing 115 kV transmission line. It would connect segments I5 and T7.

C4 Segment C4 follows the half section line of sections 18, 7, and 6 in Dewald Township and section 31 in Larkin Township. The segment is approximately 2.98 miles long and would connect segments T7 and I4.

C6 Segment C6 is a 1.05 mile segment that follows the half section line in Section 8 and 17 of Rost Township. The segment would connect segments T12 and I9.

I10 Segment I10 is a 4 mile segment that follows the north side of I-90 to avoid Summers WMA. It begins ½ mile west of 42nd Avenue and follows the north side of I-90 ending approximately ½ mile east of Highway 86.

I11 This segment begins ½ mile east of Highway 86. It is 0.65 miles long and follows the north side of I-90.

I12 Segment I12 is a 0.63 mile segment that follows the existing 345 kV transmission line corridor. This segment begins approximately 400 feet east of 460th Avenue and connects segment I11 to I14.

I13 This segment is approximately 0.86 miles long. From the end of segment I11 it continues along I-90 for approximately 1000 feet, until it turns north along the half section line in section 15 of Hunter Township.

345-kV Route Segments Added by EQB Scoping Decision

Rock County

R1 This segment is an alternative to Xcel Energy's T5 on the "Alliant Route." Xcel Energy's proposed route in this area diverts from the existing 161-kv line in order to avoid the Little Beaver Creek and nearby farmlands and residences. Instead, Xcel's proposed Segment T5 follows CSAH 6 and 131st Street, which passes less than 500 feet from several residences on 131st Street.

Jackson County

J1 This route segment deviates from I-90 by turning north along the half-section line in sections 12 and 13 in Ewington Township. Segment J1 then turns east-west along the half-section line for two miles through section 12 of Ewington Township and sections 7 and 8 in Rost Township, where it connects with Xcel Segments T12 and C6. This segment avoids several residences along Interstate I-90.

J2 This route segment provides an alternative pathway between the Alliant 161-kV line and the Lakefield Junction Substation. Xcel's route segments in this area, T12 and T13, pass near several residences. This segment takes several ninety degree turns and follows half-section lines in some areas in order to maximize distances to nearby residences. Segment J2 first extends east-west for one mile from the point where the existing 161-kV Alliant line turns north, crossing along the half-section line of sections 20 and 21 of West Heron Lake Township. It then turns north-south and follows the half-section line of 21 and 28 of the same township for one and one-half miles. At that point it turns east-west for two miles along 130th Street, crossing then along the section line cross country for one-mile to the half-section line of section 36. The route-segment then turns north-south again for one and one-half miles along the half-section line of section of Rost Township, ending in the center of section 1 of Rost Township, where it intersects route segments J3, J5 and J6.

J3 This segment provides another alternative path between the Alliant 161-kV line to the north and the Lakefield Junction Substation. It crosses east-west from Xcel's Segment T12 in the center of section 5 of Rost Township crossing along the half-section line east for four miles to the center of section 1 of Rost Township , where it intersects with Segment J5 or J6. This route-segment also intersects with new Segment J4. So this segment could use Segment J4, J5 or J6 to connect to the existing 161-kV line one mile to the south.

J4 This segment provides a one-mile north-south connection on the ¼ -section line between east-west segment J3 and the 161-kV line to the south (Xcel Segment T14). This segment is along the ¼ section line of sections 2 and 11 of Rost Township to avoid a residence on the ½ section line to the east. The route segment has a 1000 foot width to allow Xcel Energy to accommodate input from local land owners in final design should the EQB select it.

J5 This route segment provides an alternative north-south between Segment J2 or J3 to the existing 161-kV line one mile to the south, crossing through on the one-half section line of the south half of section 1 and the north half of section 12 of Rost Township.

J6 This route segment provides a third, easternmost alternative pathway between routes J2 or J3 and the existing 161-kV route one mile to the south, after which the new line would be double-circuited with the existing line on Xcel's Segment T14. This route segment J6 is, in effect, an extension of segment J3, but instead of turning south along J5 (which connects to the 161-kV line near one residence), it continues east-west for an additional one and one-half to two miles along the half-section line to approximately the section line between sections 5 and 6 in Heron Lake Township. At that point, it turns north-south for one mile to intersect with the existing 161-kV route. However, on the north-south crossing the segment as proposed allows a one-half mile wide route from which to refine the final required right-of-way—from the section line between sections 5 and 6 to the half-section line of section 5 to the east that crosses wetland areas. This allows maximum flexibility to avoid any nearby buildings or otherwise accommodate input from local land owners and local land use plans.

SECTION 4.4 THE 115-KV ROUTE ALTERNATIVES

The Nobles County to Chanarambie 115 kV transmission line requires approximately 36 to 40 miles of new transmission line from the new Nobles County Substation to the existing Chanarambie Substation near Lake Wilson, MN. Xcel Energy proposed two route alternatives: the West route and the East route, and a preference for the East Route. (See Appendix A). Both routes are entirely within the state of Minnesota. Xcel Energy requested a wider corridor of 6,600 near the Chanarambie Substation to allow greater flexibility to consolidate existing lower voltage transmission lines.

Appendix A contains overview maps of all route segments under consideration for the 345-kV line. Appendix D contains detailed maps of each 115-kV route segment map on aerial photographs. The overview maps in Appendix A also include references to the corresponding underlying detailed map included in Appendix D. Figure A6 shows Xcel Energy's preferred East route through Nobles and Murray Counties.

Xcel Energy's Preferred Route: The East Route

The East Route generally follows County and Township roads for the entire route. Detailed route maps are in Appendix D. The route will be approximately 36.6 miles if Substation A or B were chosen. The segments for the East Route from Substations A and B include EW1, E2, E3, E4, and E5. Using Substation C for the East Route would require about three extra miles of 115-kV line. The reasons for Xcel Energy's preference for this route are provided in the Application (pp. 147-148).

Land use along the East Route is primarily agricultural. In Nobles County, the line will run adjacent to areas zoned "Agricultural" throughout the route and Rural Residential (R-2) near the town of Reading. In Murray County, the line will cross areas zoned "Agricultural" and "Conservation." Conservation districts are intended to protect environmentally sensitive, scenic areas; retain major areas of natural ground cover for conservation purposes; and deter the abuse of water resources and conserve other natural resources of the county.

Reasons for Xcel Energy Preference

Xcel Energy prefers the East route, but not strongly, primarily because it has lower costs and fewer design complications near the Chanarambie Substation. The East Route costs about $2 million less than the West Route because it does not use the 13.5 miles of existing 69-kV transmission line right of way available on the West Route. Using existing transmission line right-of-way increases costs because for this project, the existing 69-kV line would be removed and replaced with a new double-circuit 115/69-kV line, which according to Xcel Energy costs about $150,000 more per mile than single-circuit 115-kV line ($500,000 per mile vs. $350,000 per mile). In addition, the large number of wind turbines and 34.5-kV feeder lines near the Chanarambie Substation on the West Route would make detailed design more complicated.

Xcel Energy's 115-kV Alternative: West Route

The West Route generally follows County and Township roads for the entire route and detailed route maps can be found in Appendix D. The route would be approximately 35.6 miles long if Substation C were chosen, versus approximately 36.2 miles if Substation A or B were chosen. The segments for the West Route from Substations A and B include EW1, W2, W3, W4, W5 and W6. Substation C uses AW1 instead of EW1 and W2 to exit the substation.

Other Possible 115-kV Routes

Figures A7 and A8 illustrate three other possible routes for the 115-kV line: West Option A is a variation of Xcel Energy's West route; East Option B, and East Option C are variations on Xcel Energy's East Route. However, the segments and substation site options under consideration can be combined in many ways to develop the best route between the Nobles County and Chanarambie Substation. All the 115-kV route segments under consideration are shown in Appendix A and in detail in Appendix D, and each is described in the next section. Data comparing all 115-kV route segments, as well as a comparison of selected routes are also provided below in Section 8.

SECTION 4.5 THE 115-KV ROUTE SEGMENTS

Xcel Energy's Application contains most of the route segments under consideration for the 115-kV line, including a description of the environmental setting for each segment. The EQB Chair selected ten route segments for the 115 kV line in addition to those proposed by Xcel Energy. The selected routes are compared below in EIS Section 8, and data for all route segments is provided in EIS Appendix H.

West Route if Substation Sites A or B Selected

EW1 follows Trunk Highway 266 northwest along the northeast side of the highway for 3.6 miles to the junction of T.H. 266 and King Avenue. The line crosses agricultural land along this segment of the route.

W2 begins at the junction of T.H. 266 and 170th Street a minimum maintenance road. The line will be routed along the north side of the road for two miles until it reaches Hesselroth Avenue.

6.3.1.2 West Route if Substation Site C Selected

AW1 follows Hesselroth Avenue north from Substation C for approximately 5.0 miles. The line will begin on the west side of Hesselroth Avenue and will shift to the east side of the road at CSAH 14 to avoid a home on the west side of the road. The road will continue north until it reaches 170th Street.

Remainder of West Route

W3 begins at the junction of segments AW1 and W2 on 170th Street and will double circuit with a 69 kV line for two miles. The line continues west from the junction of these segments, along the north side of the road, passing the Alliant Energy Wilmont Substation at Fellows Avenue. At Erickson Avenue, the line will turn north, along the west side of the road. It will follow Erickson Avenue for three miles, ending at CSAH 18/140th Street.

W4 will follow CSAH 18 as a single circuit line west for 0.5 miles toward St. Kilian. The line will continue to single circuit along new ROW as it turns north along the half section to 130th Street. At this point the line will turn west and follow 130th Street for approximately 2 miles, where it turns north along new ROW for 1.5 miles along the half section west of Durfee Avenue. The line then turns 0.5 miles west toward Dillman Avenue, where it follows Dillman Avenue north for 1.5 miles to County Road 71 at the Nobles and Murray County border.

W5 follows County Road 71 west for approximately 0.5 miles to 70th Avenue. Along the west side of the road the line follows 70th Avenue for three miles, where it may double circuit with an existing 69 kV transmission line for the remainder of the segment. North of CSAH 4/156th Street, the line will cross to the east side of the road. This will distance the line from the Chandler WMA, which is located west of 70th Avenue. The segment will end at 91st Street, approximately one mile south of Lake Wilson.

W6 begins at the junction of 70th Avenue and 91st Street along the south side of the road and will double circuit with the 69 kV transmission line. The line will continue to double circuit as it crosses to the north side of 91st Street at South Ridge Substation. At 50th Avenue, the line crosses to the

south side of 91st Street. At CSAH 26/40th Avenue the land use changes slightly, since many of the agricultural fields in this area have wind turbines dotting the landscape. The line will turn north toward the Chanarambie Substation at 10th Avenue for two miles. The line will turn west at 111th Street for 0.5 miles. At the ½ section line, the segment will turn north entering the Chanarambie Substation. Due to the amount of wind development in this area, it has started to become congested in the area near Chanarambie Substation. Xcel Energy is asking the EQB for flexibility to reach the Chanarambie Substation from 91st Street and is asking for a corridor that extends between 20th Avenue and County Line Avenue. Additionally, Xcel Energy requests the option of relocating the 115 kV transmission lines near Chanarambie substation to accommodate the new transmission line.

East Route if Substation Sites A and B Selected

EW1 follows Trunk Highway 266 northwest along the northeast side of the highway for 3.6 miles to the junction of T.H. 266 and King Avenue. The line crosses agricultural land along this segment of the route.

Remainder of East Route

E2 begins at the junction of T.H. 266 and King Avenue. The line would follow the west side of King Avenue north approximately three miles to the north side of 140th Street. The line turns west at 140th Street and crosses over from the north to the south side of the road approximately 3300 feet from the corner of 140th Street and King Avenue. This will avoid impacting homes along this segment and will distance the transmission line from the Einck WMA. The line continues to follow 140th Street until it reaches Erickson Avenue.

E3 continues north along the east side of Erickson Avenue for four miles to County Road 72 at the Nobles and Murray County border. The line follows the south side of the County Road 72, west for 2.5 miles across agricultural land to 80th Avenue.

E4 is nine miles in length. It begins at the junction of County Road 72 and 80th Avenue. The line will follow the east side of the road for approximately three miles, where it crosses to the west side of the road one mile north of CSAH 1. The line will continue for one mile along 80th Avenue, passing near Dierenfield WMA. At this point, 80th Avenue becomes CSAH 28. The line will continue to single circuit along the west side of CSAH 28 avoiding homes along the segment. The segment ends at the junction of 91st Street and CSAH 28 near the Carlson WMA and Lake Wilson Nobles Cooperative Substation.

E5 continues along CSAH 28 for 3.3 miles, passing near Peters WMA. At this point, the line will turn east along the field margin. Xcel Energy would like flexibility in this section of the route to avoid impacting the homes at the corner of 80th Avenue and County Road 86/121st Street to avoid impacting two homes along 121st Street. The line will continue east along the south side of 121st Street road for approximately two mile. At TH 91 it will cross to the north side of the 121st Street. The line will run adjacent to the 121st Street ROW through agricultural fields. At 10th Avenue the line crosses to the south side of the road where it will double circuit with an existing 115 kV line for approximately 0.5 miles to Chanarambie Substation. Additionally, Xcel Energy requests the option of relocating the 115 kV transmission lines near Chanarambie substation to accommodate the new transmission line.

Crossing Routes

C1 is a ½ mile segment along 100th Street. It is a crossover segment between segments E3 and W5.

C2 is a one mile segment along 91st Street. It is a crossover segment between segments E5 and W6.

115-kV Route Segments Added by EQB in Scoping Decision

Nobles County

N1 This is a one-half mile route-segment that follows County 18 for one-half mile, connecting Xcel Energy's East and West Routes.

N2 This route-segment provides an alternative to Xcel's Segment W4 in the area, which passes near several residences and crosses crop land in sections 8 and 17.

N3 This one-half mile long route-segment is an optional connection between Segment N2 and Xcel route-segment W4.

N4 This one-half mile long route-segment follows 120th Street and then turns north-south along Dillman Avenue where there are no adjacent homes, instead of crossing fields in section 8 as proposed by Xcel's Segment W4.

N5 This is an approximately one and one-half mile route-segment (See Figure 5) that is included for study in the EIS as a potential connecting route for the 115-kV line between a Nobles County Substation in Study Area B and the 115-kV routes.

Murray County

M1 This is a one-mile long north-south segment through section 32 of Fenton Township as an alternative to Xcel's Segment W5 along 70th avenue, which has two adjacent residences and associated tree groves.

M2 This is a one-mile long east-west segment that crosses between Xcel's East and West Routes along a township road, also intended to provide an alternative to Xcel Segment W5 that avoids the homes and tree groves along 70th Avenue to the south.

M3 This route-segment (with route-segment M5) is an alternative that largely follow Murray County 29, and is intended to provide alternative routes to study in the EIS that may pass near fewer homes than Xcel's proposed routes in this area.

M4 This is a two-mile long segment that provides an alternative cross-over from Segment M3 on County 29 to the Xcel Segment E4.

M5 This route-segment intersects with Segments M4 and M3 and extends east along County 29 for one-half mile and then turns north to follow County 29 for four miles, where it then intersects 91st at an existing 69-kV transmission line.

SECTON 4.7 DESIGNATED ROUTE WIDTH

Under the Minnesota Power Plant Siting Act, a "route" may have a variable width of up to 1.25 miles. This allows flexibility in final design and allows landowner input on exact route and on such details as pole placement. For this project, Xcel Energy has requested 660 feet on each side of the centerline, which they feel is adequate flexibility for most areas along a route. However, near the Chanarambie Substation, Xcel Energy has requested a the maximum 1.25 mile route width in order to allow maximum flexibility to consolidate existing lower voltage lines and accommodate wind turbine development. (Application, p.15) The EQB staff also proposed that a wider route should be considered on two potential route segments in Jackson County (Segments J4 and J6), which cross farm fields or wetland areas on new right-of-way.

Based largely on landowner concerns during scoping, EQB staff asked Xcel Energy to evaluate specific detailed design questions regarding the following seven route segments

- Along 345 kV segment I8 in Ewington Township in Jackson County on the north side of I-90 near some residences;
- Along 345 kV segment I5 south of Luverne, where there are potential conflicts with existing businesses and land use plans for the area;
- Alone 115 kV segment W6 where it might be possible to consolidate a new 115 kV line with an existing 69 kV line and a 34.5 kV line;
- Along 115 kV segment W6, where Xcel Energy has requested flexibility in final design;
- Along 115 kV segment E5, where a new 115-kV line could be consolidated with existing 34.5 kV lines and there are a number of residences close to the road;
- Along 345-kV segments J4 and J6, where the new 345-kV line would have to cut across farm fields, at the section line or elsewhere, and additional design flexibility may be warranted to allow detailed landowner input

Xcel Energy's analysis of these route segments and related issues are provided in Xcel Energy's responses to Information Request 10, dated November 15, 2004, attached in EIS Appendix E.

SECTION 5.0 NOBLES COUNTY SUBSTATION SITE

This section is divided into the following three subsections:

- Section 5.1 Substation Locations
- Section 5.2 Substation Criteria
- Section 5.3 Substation Site Comparison

SECTON 5.1 SUBSTATION LOCATIONS

The new Nobles County Substation will be constructed near Reading, MN. Xcel Energy has identified three general areas where the substation could be located. These three locations are shown in Appendix C and are designated as Substation A, Substation B and Substation C. The actual substation site needs a minimum of about fifteen acres and will be designed to accommodate the 115 kV and 345 kV transmission lines. Details regarding the environmental setting for each of the three areas are provided in the Xcel Energy Application (Application, Section 5).

Xcel Energy prefers to buy the required site from a willing seller. Therefore, Xcel Energy has so far only identified a general area, not the exact site, for the substation to allow flexibility to work through site location with the landowner. A minimum fifteen acre site is required for the substation. But Xcel Energy plans to acquire a substation site that would be a minimum of 40 acres. A 40-acre site will provide a buffer zone from residences and other nearby land uses and provide room for likely future low-voltage feeder lines from wind energy projects—as well as possible additional high-voltage transmission lines. The exact size of the site area to be specified in the EQB route permit not been determined yet. Xcel Energy may propose specific sites within the identified areas as the permitting process moves forward.

Xcel Energy Preference

All three sites are acceptable to Xcel Energy; however, the Company prefers Substation Site A. Xcel Energy's reasons for preferring Site A are provided in the Application (Application, p. 122). Xcel Energy prefers Site A primarily because it provides the shortest route to their preferred "East" route on the 115-kV line. Substation B would require some additional roadway upgrading and a slightly longer 115-kV transmission line. And Substation C is has at least one planned residence nearby and other residences within the area. It would also require additional archeological surveys because there are more nearby artifacts registered for that area at the State Historic Preservation Office. There are not substantial differences in cost.

SECTION 5.2. SUBSTATION CRITERIA

The EQB rules do not specify specific criteria to consider for siting substations. However, during scoping, Xcel Energy with local citizen input (see Scoping Decision) developed the following criteria to consider:

1.0 Minimum 40-Acre Parcel: An absolute minimum of 15 acres is required to accommodate the size of the substation and to provide a small buffer area. Xcel Energy prefers to have 40 acres for the substation because that would provide more buffer area from nearby residences. A larger site would also allow Xcel Energy to develop a vegetative screen and perhaps most importantly help accommodate additional transmission and wind feeder lines that will be entering substation. A larger site will also buffer the property from wind development. Some of Xcel Energy's existing substations (such as Chanarambie and Buffalo Ridge) have had considerable wind turbine development around them, which can limit the ability to route transmission lines into the substation.

2.0 Maximize Wind Interconnection Opportunities and Minimize Interconnection Costs: The proposed Nobles County Substation will be used to interconnect 34.5 kV feeders from nearby wind energy projects. So the Nobles to Chanarambie 115 kV line needs to stay relatively near to the Buffalo Ridge to accommodate additional substation interconnects that will be required. For example, the Community Wind South Project, which is near Substation Site B, plans to tie into the Nobles County Substation. Other wind easements occur near all three substation areas; and the wind resource is not significantly different near the three areas under consideration.

3.0 Availability of nearby corridors or routes for potential future high-voltage transmission line interconnections: Since this will be a major substation, additional future high-voltage transmission lines will likely be tied into the site. It is uncertain what will be proposed, but it is reasonable to assume that additional 345 kV lines will be considered. Xcel Energy currently thinks it is most likely that these lines would go north toward the Twin Cities or south toward Iowa. The main issue that would help address this concern is to purchase adequate land for the substation and buffer, and to site the lines so there is minimal conflict with future lines.

Other Important Considerations:

4.0 Acceptable Terrain

5.0 Proximity to 345 kV transmission line route and 115 kV transmission line route:

6.0 Avoid wetlands and wildlife areas

7.0 Willing seller: Xcel Energy prefers to build the substation on a site with a willing seller. They prefer that the route permit only identify a general area, not the exact site, for the substation to allow flexibility to work through the specific site location with the landowner.

SECTION 5.3 SUBSTATION SITE COMPARISON

The three potential substation sites are compared below in Table 4. However, Xcel Energy's criteria of a "willing seller" is not included in the comparison since this information is not available yet.

Table 4
Substation Site Comparison

Site	Proximity to 345 kV and 115 kV Routes	Residences	Wetlands/ Wildlife	Wind Interconnection	Terrain	Size	Nearby Corridors and Primary Roads	Proximity to Other Transmission Lines
A	Closest in proximity to both transmission lines.	Within the site there are 15 homes. Near larger congregation of homes in Reading. Future lines can avoid Reading from the east, west, and north.	18 NWI wetlands located within the site (33.6 acres). Greater than 9400 feet from the edge of the site to a WMA.	Similar to B and C. Farther north, so closer to area where the probability that wind development will occur is higher, and, consequently, feeder lines into the substation. Substation is located on Buffalo Ridge.	Terrain is more of a factor during micrositing/design phases of project development. At a macroscale, the terrain is similar to B and C, characterized by rolling hills.	Same availability for land as Site B.	Adjacent to a major highway. Number of county and township roadways are similar to B and C. No transmission line corridors other than the 161 kV line are present.	No transmission lines are present other than the 161 kV line shared by all three sites.
B	An additional 1.5 miles of 115 kV transmission line will be needed to reach the site.	Within the site there are 11 homes. Lines would avoid Reading from the south and west. Future lines from the north and northeast would need to pass near larger congreation of homes in Reading.	19 NWI wetlands located within the site (23.6 acres). 4800 feet from the edge of the site to a WMA.	Similar to A and C. Wind interconnection opportunities are available. Substation is located on Buffalo Ridge.	Terrain is more of a factor during micrositing/ design phases of project development. At a macroscale, the terrain is similar to A and C, characterized by rolling hills.	Same availability for land as Site A.	Adjacent to a major highway. Number of county and township roadways are similar to A and C. No transmission line corridors other than the 161 kV line are present.	No transmission lines are present other than the 161 kV line shared by all three sites.

C	Similar to Site A if the 115 kV segments to the west are selected.	Within the site is 12 homes. Future lines would avoid large congregations of homes in all directions.	47 NWI wetlands within the site (52.6 acres). Adjacent to Bluebird WMA to the southeast. Has the potential for the most issues related to wetlands/wildlfie due to the presence of 3 waterways.	Similar to A and B. Wind interconnection opportunities are available. Substation is located on Buffalo Ridge.	Terrain is more of a factor during micrositing/ design phases of project development. At a macroscale, the terrain is similar to A and B, characterized by rolling hills. However, Site C can be considered slighlty more hilly and sites are limited due to the streams that traverse the site.	Less land available for development and negotiation due to the "unbuildable" areas created from the presence of the three creeks at the site.	Not adjacent to a major highway. Number of county and township roadways are similar to A and B. No transmission line corridors other than the 161 kV line are present. Area is more rural in nature than A and B.	No transmission lines are present other than the 161 kV line shared by all three sites.

SECTION 6.0 TRANSMISSION LINE IMPACTS AND CONSIDERATIONS

The Xcel Energy Application provides detailed information regarding the natural environment, human health, land use, and socioeconomics for the route areas under consideration. The EIS does not repeat this information but incorporates it by reference. This section of the EIS focuses on (1) providing any new information developed since the Application was completed and (2) summarizes the major potential impacts of the proposed transmission line for which there may be significant differences between route alternatives. This section is divided into the following topics:

Section 6.1 Background
Section 6.2 Residences: Electric and Magnetic Fields;
Section 6.3 Agriculture;
Section 6.4 Waterfowl Collisions;
Section 6.5 Rare and Endangered Species;
Section 6.6 Archeological and Historic Resources;
Section 6.7 Property values;
Section 6.8 Pole Relocation: Potential Economic Impact on Local Government

SECTION 6.1 BACKGROUND

Natural Environment

Xcel Energy's Application provides an overview of the environmental setting and potential impacts to the natural environment for the route areas under consideration (Application, sections 4.4.6., 4.5.6, 6.3.6, and 6.4.6). The primary natural features of concern are the many wetlands used by waterfowl and other species, and remnants of virgin prairie, which are scattered throughout the project area. For all route alternatives, the prairie areas can be avoided through detailed pre-construction surveys and designs, as well as careful construction techniques. Also, the Application contains comprehensive lists of protected species and their habitat in the project area. One section of the Alliant route does cross the Rock River, which is a critical habitat for a federally protected minnow called the Topeka Shiner. See EIS Section 6.6, below, for details.

Wetlands and WMA.

The Application includes a comprehensive list of nearby wetland and wildlife management areas, including a list of streams and ditches crossed by proposed routes, many of which are on the Department of Natural Resources Public Waters Inventory (PWI) maps. All routes for both the 345-kV line and the 115-kV line span wetlands listed on the National Wetlands Inventory (NWI). Both the PWI and the NWI wetlands and waterways are identified on the maps in EIS Appendices B, C, and D for all routes and route segments under consideration. Nearly all the

wetlands can be spanned without requiring pole placement and construction in the wetland itself. The two possible exceptions are first a large wetland that on segment T9 that is on both the Alliant and the I-90 route where the I-90 route turns north of Worthington. The second wetland that may not be able to be entirely spanned in on segment T13, on the Alliant route in Jackson County. There are alternative route segments that could be used on the Alliant route instead of segment T13, however. Also, detailed construction design may indicated that one or both wetlands can be spanned without requiring disruption to the wetland itself.

Land Use, Economics, and Related Issues

The Application (sections 4.4.3, 4.5.3, 6.3.3, and 6.4.3) addresses the impacts to human settlement by the proposed project and include a discussion on land use, displacement, noise, aesthetics, socioeconomics, cultural values, recreation, and public services. Stray voltage is discussed in Section 3.5.3 of the Application.

SECTION 6.2 HUMAN HEALTH: ELECTRIC AND MAGNETIC FIELDS

The most common human health concern expressed about high voltage transmission lines is the long-term impacts of electric and magnetic fields. Electric fields are lines of force exerted on electrically charged particles. Electric fields are measured in units of volts/meter. Magnetic fields, on the other hand, are lines of force exerted on moving charged particles—or current. Magnetic flux density is measured in units of gauss, or milligauss.

The intensity of the electric field is related to the voltage of the line. But magnetic fields are produced by moving electrical charges. Therefore, the intensity of the magnetic field is directly related to the current flow through the conductors (wire). So a higher-voltage transmission lines do not necessarily produce stronger magnetic fields than lower voltage lines. (See Table 5, below). Magnetic fields are generally considered to have more potential for affecting human health, in part, because electric fields are more easily reduced by shielding.

After over twenty years of study, research continues regarding the potential health effects of magnetic fields on humans. The results of this research is not repeated here. Instead, a summary is provided in the Xcel Energy Application Section 3.5, and additional references are provided below in EIS Section 8.0.

In general, however, there is general scientific consensus that there is little evidence that magnetic fields from transmission lines negatively impact human or animal health. Nevertheless, it is difficult to prove conclusively that there is no impact. And some studies have shown a weak but possible correlation between magnetic fields and childhood leukemia and other serious human health problems. Therefore, the Minnesota Health Department and other governmental agencies generally recommend a "prudent avoidance" policy in which exposure is minimized. (See, e.g., Minnesota Working Group on EMF *White Paper*, 2002)

Predicted Electric and Magnetic Fields

Modeled electric and magnetic fields for the 345 kV and 115 kV lines are provided in Table 5. The predicted electric field densities are less than half of the 8 kV/m maximum allowed in EQB route permits. There is no standard for magnetic field strength in Minnesota. The predicted magnetic field flux densities at maximum current flow, measured in milligauss (mG), are also shown in Table 5. The predicted levels decrease rapidly away from the centerline, reaching approximately background levels of 2 mG about 300 feet or less from the proposed transmission lines.

TABLE 5
CALCULATED MAGNETIC FLUX DENSITY (MILLIGAUSS FOR PROPOSED TRANSMISSION LINE DESIGNS (3 FEET ABOVE GROUND)

Line	Type	Condition	Amps	Distance to Proposed Centerline								
				-300'	-200'	-100'	-50'	0'	50'	100'	200'	300'
Split Rock to Lakefield 345 kV	Single Circuit H-Frame	Average	540	2.0	4.3	16	42	68	42	16	4.3	2.0
		Peak	900	3.3	7.2	26	70	113	70	26	7.2	3.3
	Single Circuit Single Steel Pole Davit Arm	Average	540	1.1	2.6	9.9	31	65	28	11	3.1	1.4
		Peak	900	1.9	4.3	16	51	108	47	18	5.1	2.4
	345/69 kV Single Steel Pole Davit Arm	Average	540/ 120	1.3	3.0	11	34	61	23	9.7	3	1.4
		Peak	900/ 200	2.2	5.0	19	56	102	38	16	5	2.4
	345/161 kV Single Steel Pole Davit Arm	Average	540/ 400	0.7	1.9	8.5	27	53	15	3.6	0.5	0.1
		Peak	900/ 660	1.2	3.1	5.9	45	88	25	5.9	0.8	0.2
	345/345 kV Single Steel Pole Davit Arm	Average	540/ 540	0.4	1.1	6.4	24	64	24	6.2	1.1	0.4
		Peak	900/ 900	0.6	1.8	11	40	106	39	10	1.8	0.6
Chanarambie To Nobles County 115 kV	Single Circuit, Single Steel Pole Davit Arm	Average	1080	1.1	2.6	10	30	87	32	11	3.1	1.4
		Peak	1800	1.9	4.3	16	50	146	53	18	5.2	2.4
	115/69 kV Single Steel Pole Davit Arm	Average	1080/ 120	1.6	3.6	14	44	102	28	10	3.1	1.4
		Peak	1800/ 200	2.6	6.1	23	73	169	47	17	5.1	2.3
	115/34.5 kV Single Circuit Underbuild Single Steel Pole Davit Arm	Average	1080/ 350	1.4	3.0	11	35	115	34	11	3.1	1.4
		Peak	1800/ 700	2.3	5.2	19	61	202	57	19	5.2	2.3
	115/34.5 kV Double Circuit Underbuild Single Steel Pole Davit Arm	Average	1080/ 350/ 350	1.4	3.0	11	30	77	30	11	3.1	1.4
		Peak	1800/ 700/ 700	2.4	5.2	18	51	136	50	19	5.2	2.4

Mitigation

The primary method for reducing human exposure to magnetic fields from transmission lines is to avoid routing them near residences where possible. Maximizing distances also helps reduce visual impacts. Therefore, routes and route-segments comparisons in this EIS include a count of the number of residences with 300 feet and 1000 feet of a proposed center line for each route and segment under consideration.

Another technique to reduce magnetic field strength is to design the conductors such that alternating magnetic fields from adjacent conductors cancel each other.

Xcel Energy in its Application has also endorsed the "prudent avoidance" guidance suggested by many public agencies. This includes using structure designs that minimize magnetic field levels and siting facilities in locations with fewer people living nearby. Xcel Energy has also committed to working with landowners to route the transmission line the greatest distance practicable from residences and minimize impacts to farm outbuildings. In addition, Xcel Energy has committed to avoiding induce voltage or other electrical problems by meeting all residential setbacks required by local, state, NESC, and Xcel Energy standards as described above in Section 3.9.

SECTION 6.3 AGRICULTURE

Detailed information on the agricultural impacts are provided in the Application in Sections 4.4.4.1 and 4.5.4.1.

The most obvious impact on agriculture is the removal of tillable soil due to putting the utility poles in fields. A summary of the agricultural impacts for each route segment is identified in the Application (Appendix E). The total permanent agricultural area required for the utility poles for the 345-kV line is only about 0.5 acres. However, the amount of land removed from farming due to the utility poles is only one part of the potential disruption. Other farm related impacts include the following:

- Disruption of farming operations by creating turning problems for machinery
- Difficulty in maintaining efficient fieldwork patterns
- Facilitates weed encroachment without proper management
- Compacts Soils during construction
- Potential for damaging drain tiles during construction
- Potential for crop damage during and following construction
- May result in safety hazards (ex. collisions)
- Increased erosion potential of soils if windbreaks are removed
- May prevent or hinder aerial application of pesticides

(Wisconsin PSC, 2004)

Mitigation

The following methods can be used to minimize farming disruption: (1) use routes away from cultivated fields, (2) share existing right-of-way with roads, railroads, or existing transmission lines, (3) use single-pole structures instead of H-frame or other multi-pole structures (4) compensate farmers for construction related impacts.

Use Single-Pole Structures. Xcel Energy has proposed single-pole steel structures that will minimize interference to farming operations and the potential for collisions. They have attempted to locate the transmission line segments along existing rights-of-way and have minimized areas where the transmission line will go cross-country along new right of way.

Share Transmission Right-of-Way. In areas where a route follows an existing transmission line, where feasible the older structures will be removed and the new line will be installed with the existing line on one set of single pole structures—as a "double-circuit." This results in minimal if any new right-of-way being required in these areas.

Share Road Right-of-Way. Paralleling roadways reduces but does not eliminate the need for new right-of-way. Xcel Energy is proposing to place utility poles along roadways not inside the public right-of-way, but usually about five feet into adjacent fields. This is partly for public safety reasons, but also to avoid liability for having to pay to move the poles in the future should the county or township decide to widen the roadway. Also, along I-90, the Minnesota Department of Transportation requires placing poles outside the highway right-of-way except in hardship situations. For the 345-kV line, paralleling a roadway reduces the width of the required transmission line right-of-way from 150 feet to 80 feet. For the 115-kV line, it reduces the required transmission right-of-way width from 75 feet to 42.5 feet. (Figures 7 and 8.) The potential economic impacts of this policy on local government are briefly evaluated in EIS section 6.7 below by reviewing county roadway expansion plans along potential route segments.

Compensate for Construction Impacts. During construction, compaction of soils and damage to crops is likely. Xcel Energy will attempt to construct the transmission line before crops are planted or following harvest. In the event that Xcel Energy cannot meet this goal, they will compensate the landowner for crop damage and soil compaction that occurs as a result of the project. Soil compaction is normally addressed by compensating the farmer to repair the ground or by using contractors to come in and chisel plow the site. Normally a declining scale of payments is set up over a period of three years (Application, 98). Xcel Energy will also work with landowners to identify drain tile lines. They will compensate landowners for repairs to drain tile lines damaged by the project.

FIGURE 7
345 KV ROW WHEN PARALLELING ROAD

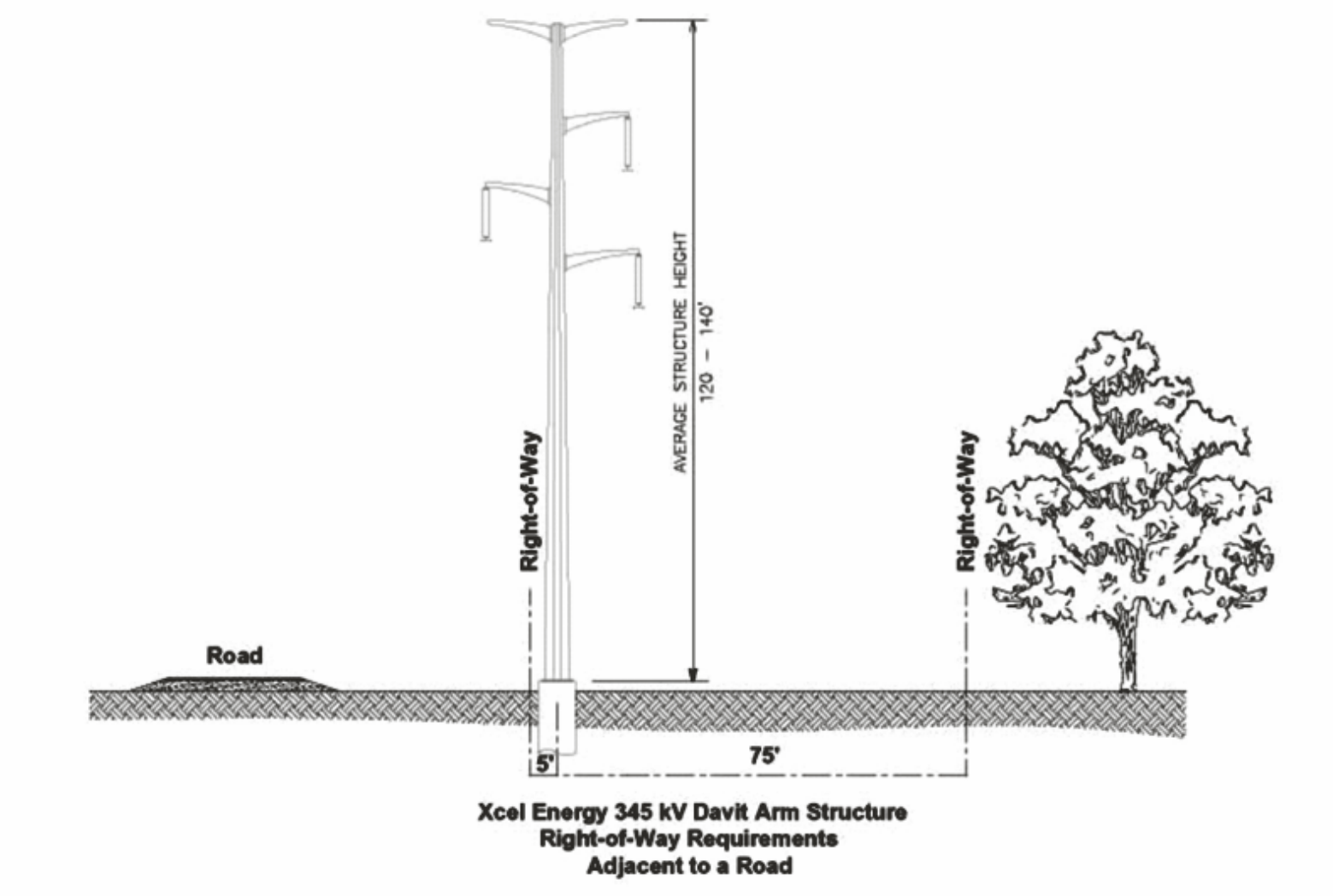
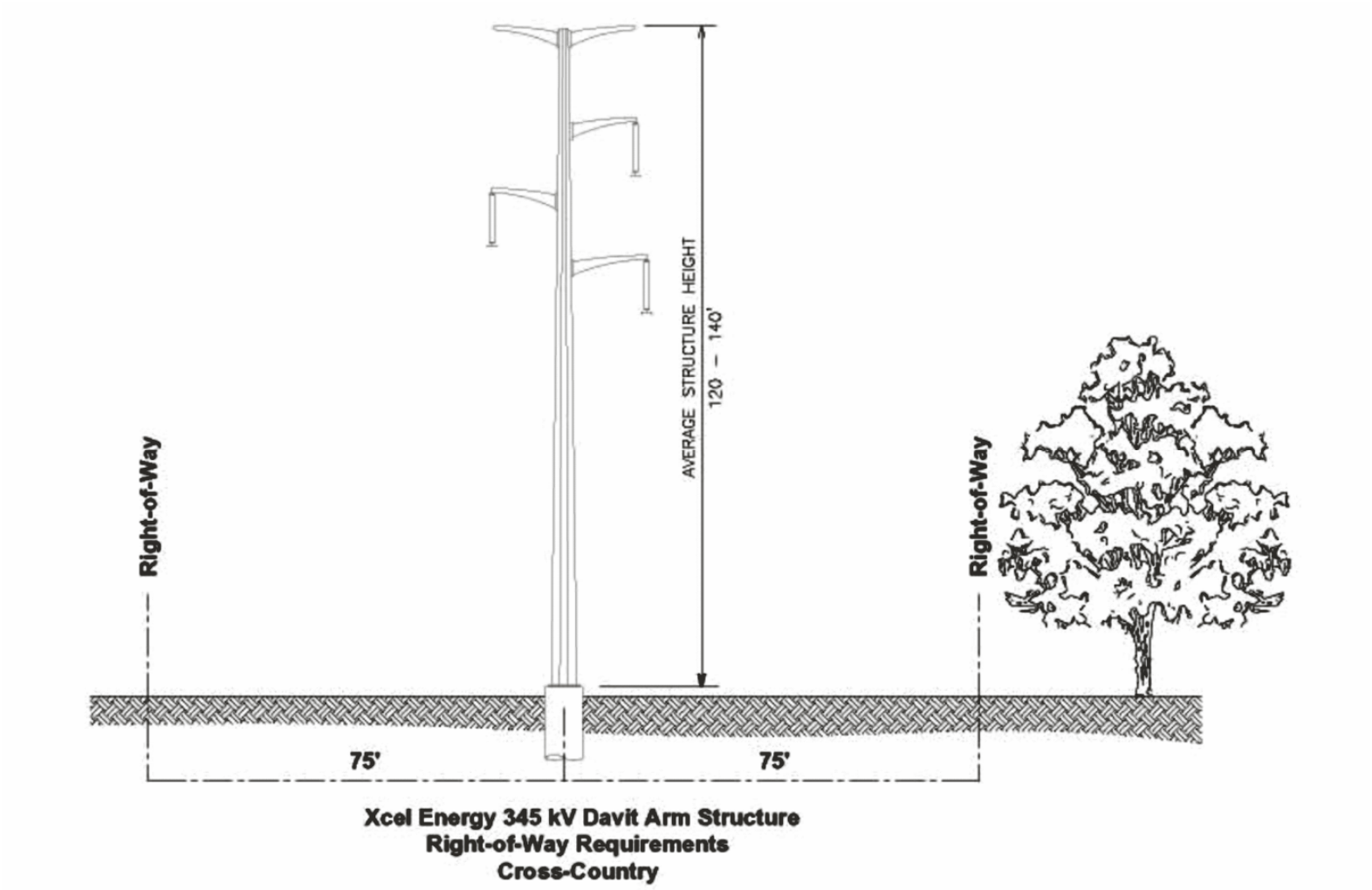


FIGURE 8
345 KV ROW CROSS-COUNTRY



SECTION 6.4 WATERFOWL COLLISIONS

Waterfowl collisions with transmission lines have been recognized as a problem for over thirty years. There are over twenty-five wildlife management areas (WMA) or designated waterfowl production areas (WPA) in the area of the proposed routes. The nearby Heron Lake WMA is a particularly important waterfowl area. Local citizens and the Minnesota DNR identified this area as an important flyway and landing area for waterfowl. South Heron Lake is located within two miles of one of the 345-kV route segments in Jackson County. See Figure A3 in Appendix B. In addition, avoiding waterfowl collisions also reduces the possibility of outages damage to utility equipment. Also, in prairie areas, raptors often use utility poles as effective hunting perches that would not otherwise be available. Therefore, potential waterfowl impacts are an important consideration in final route selection.

In general, there are more WMAs along the 115 kV routes than on the 345-kV routes. The Application describes the Chandler WMA and other significant WMAs in the area of the proposed 115 kV transmission line.

Without detailed species and flight data, it is not possible to precisely quantify the potential impact on waterfowl for various routes under consideration: many factors affect the potential for collisions. However, in general, the closer the power line is to waterfowl feeding areas and habitat, or if the line is between these two areas, the more likely it is there will be waterfowl collisions with the line. Therefore, the first line of defense is to avoid routing the line through heavily used waterfowl feeding areas or habitat. Table 6 below identifies the wildlife management areas and the U.S. Fish and Wildlife Service (USFWS) Waterfowl Production Areas within two miles of the proposed route alternatives. A conservatively wide two mile buffer was used to identify these areas since waterfowl collisions are reported to be negligible at distances greater than one mile from areas of bird use. (Avian Power Line Interaction Committee, 1994). Appendix H also provides data for all wetlands and waters crossed, and nearby WMA/WPA data for each route segment under consideration.

Mitigation

In addition to routing the line away from wetlands and other areas used by waterfowl, flight diverters can be installed on lines that are close to WMAs, lakes, rivers, and wetlands. The other primary method is to install H-frame structures instead of single pole structures to reduce height and avoid multiple vertical wires. Xcel Energy and the DNR will work together to identify areas along the transmission lines where mitigation is appropriate such as near wildlife areas to prevent impacts to waterfowl and other avian species. The Xcel Energy Application contains details on specific design methods to reduce potential collisions. (Application, p. 81)

Table 6
WMA/WPA within 2 miles* of Route Segments

Route	WMA/WPA	Route Segment(s)	Distance to Segment (Miles)
345	Rock River	T7	Adjacent
345	Russ Blanford WMA	I5	Adjacent
345	Springwater WMA	T5	1.5
345	Bluebird Prairie	T7	0.5
345	Herlein-Boote	I6	0.8
345	P.F. Mulder	I5	1.4
345	Summers WMA	I10	Adjacent
345	Jackson County WPA	T13	0.2
115	Einck	E2	Adjacent
115	Swessinger	E2	2.0
115	Fenmont	E3	1.0
115	Chandler	W5	Adjacent
115	Carlson	E4	Adjacent
115	Peters	E5	1.0
115	Leeds	E5	0.8
115	Salt and Pepper	W6	1.5
115	Scheuring	E3	2.0
115	Cleanwater	E3	2.0
115	Gallinago	M3	Adjacent
115	Dierenfield	E4	0.7
115	Humphery	M4	0.3
115	Melchior	M3	2.0
115	Tennessen	M5	0.4
115	Henry Vos	M5	0.2
115	Schoeberl	M3	2.5

**Schoeberl WMA is greater than 2 miles from the route segment. However, the DNR has highlighted it as an area with large numbers of migrating waterfowl in the spring (Schoeberl WMA).*

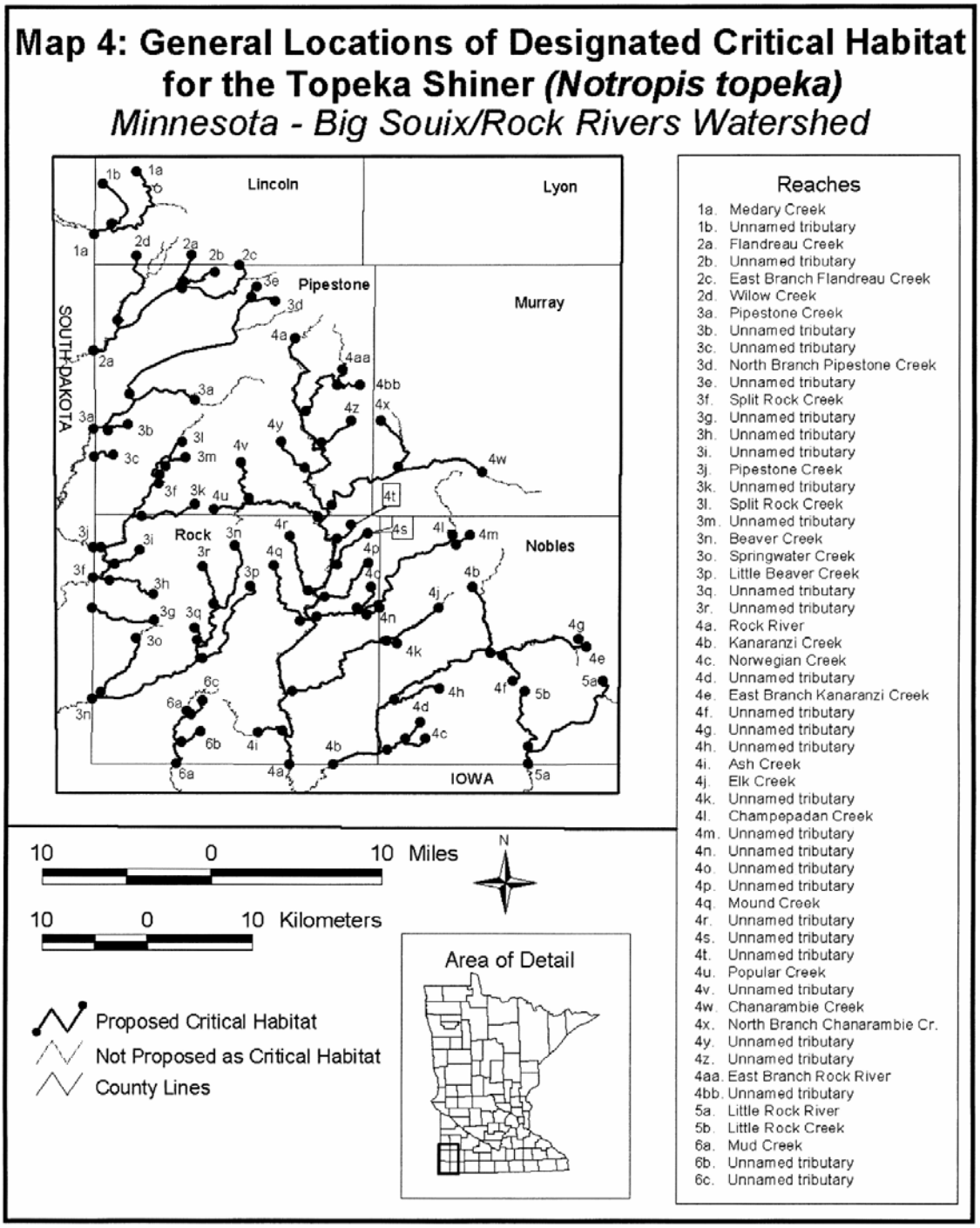
SECTION 6.5 THREATENED AND ENDANGERED SPECIES

The Application includes detailed discussions of the rare and unique resources within one-half mile of the proposed routes. (Application Sections 4.4.7, 4.5.7, 6.3.7, and 6.4.7). No rare or unique resources were identified for the additional route segments added by the EQB, except one. Alternative route R-1 crosses the Rock River in several areas, and the Rock River is listed as a "critical habitat" for a species of minnow called the Topeka Shiner. Construction activity will be required in the Rock River area if the "Alliant" route is selected, whether it is to remove the existing structures along segment R1, or to remove them and reinstall the new and old line as a double-circuit on route R1.

Topeka Shiner

The proposed route segments cross areas designated as "Critical Habitat" for Topeka Shiners (*Notropis topeka*). The USFWS listed the "Final Designation of Critical Habitat for the Topeka Shiner" on July 27, 2004. Critical habitat designates areas that contain habitat essential for the conservation of a threatened or endangered species and which may require special management considerations (USFWS 2004 http://midwest.fws.gov/endangered/fishes/tosh-qas.html). The figure below is taken from the Federal Register document detailing the final designation and shows the stream reaches that have the Critical Habitat designation.

Figure 9
Topeka Shiner Critical Habitat Map



Mitigation

If the Alliant route is selected, to protect the Critical Habitat for the Topeka Shiners in the streams that are designated in the Rock River watershed, Xcel Energy will use the recommendations outlined by the USFWS in their publication "Construction Projects Affecting Waters Inhabited by Topeka Shiners (*Notropis topeka*) in Minnesota" to avoid impacts to this species.

SECTION 6.6 ARCHEOLOGICAL AND HISTORIC RESOURCES

Xcel Energy requested known cultural resource (archaeological sites, standing structures, other historic sites) location information from the Minnesota State Historic Preservation Office (SHPO) in spring 2004. Appendix E of the Xcel Energy Application contains a detailed accounting of previously recorded cultural resources by the associated route segments.

In November 2004 Xcel Energy requested supplemental information based on the addition of the new alternative route segments described in Sections 4.3 and 4.4 of the EIS. Two architectural properties, bridges over Little Beaver Creek (RK-BCT-012) and a tributary (RK-BCT-008), are near the 345 kV Alternative Route Segment R1 in Rock County. While property RK-BCT-008 is approximately 1 mile south of R1, property RK-BCT-012 spans Little Beaver Creek and is under the existing transmission line. Another property, the Leeds Township Hall (MU-LED-001), is adjacent to the 115 kV Alternative Route Segment M5 in Murray County.

In spring 2004 Xcel Energy also requested that the SHPO review the proposed routes for possible impacts to known or suspected historic properties. The SHPO responded that, based on the information presented, an archaeological survey of the project was not necessary. However, the SHPO did request an assessment of the impacts to Buffalo Ridge, which is statutorily listed on the State Register of Historic Places per Minn. Stat. §138.663 and Minn. Stat. §138.664, Subd 13.

Mitigation

No impacts to previously identified archaeological resources or historic structures are anticipated. The probability of archeological artifacts along the proposed routes appears to be low and no impacts to previously unknown cultural resources are anticipated. Also, that the proposed project is not expected to physically impact any unrecorded historic structures. With regard to these cultural resource types, no mitigation measures are needed.

Regarding Buffalo Ridge' status on the State Register of Historic Places, the SHPO staff, cultural resources professionals, and other interested parties acknowledge the perceived importance of Buffalo Ridge as a cultural property. And there is the potential for generalized impacts from existing and continued wind turbine development and transmission lines on this cultural resource. But the issue is outside the scope of this EIS, which covers one specific project.

However, should the issue be studied in the future, the first step of trying to assess impacts to Buffalo Ridge as a cultural resource would be to better the define exactly what the Buffalo Ridge cultural resource is. The EQB staff and SHPO have met informally since the Application was submitted on April 30, 2004 to discuss the matter. The EQB has agreed to consider developing a work plan that will attempt to address the cumulative impacts of EQB wind permit and transmission line permits on the Buffalo Ridge. The scope of this additional work, however, is outside the scope of the current project and will be defined by future discussions between the EQB and the SHPO.

SECTION 6.7 PROPERTY VALUES

The impact of a new transmission line on property values arises in nearly every public discussion of transmission line permits. Many studies have been conducted in recent years relating changes in property values and transmission lines. Two recent literature reviews are by Kroll and Priestly (1992) and EPRI (2003). Both studies point out that one of the difficulties in determining the impact on property values is the wide range of methodologies used to measure impacts. (EPRI 2-1; Kroll and Priestly 57). As illustrated in the discussion below, it is difficult if not impossible to predict the likely impacts on property values of this particular project, let alone differences between alternative routes. Nevertheless, a summary of research on the topic is provided below.

Literature Overview

There have been few studies within the last twenty years that evaluate the impacts of transmission lines on property values in Minnesota. Between 1978 and 1982, Jensen and Weber and the Jensen Management Company conducted three studies in west-central Minnesota. The studies in 1978 and 1982 are of particular interest since they consider effects to agricultural land. The 1978 study found that the landowners cited an inconvenience to the presence of the line, but had not paid less for their land (EPRI B-4). The 1982 study, however, found there was a broad range of effect from no effect to a 20% reduction, which depended on the amount of disruption to farm operations (EPRI B-3).

The most recent study in Minnesota is by Shenehon Company titled, “Results of Power Line Study in Maple Grove, Minnesota” was completed in January of 2004. The study was funded by Great River Energy and evaluated property values in the northwest suburban area of the Twin Cities. EQB staff reviewed this study and others from around the country in the “Environmental Assessment for Great River Energy 115 Proposal Plymouth-Maple Grove” (EQB Docket No. 03-65-TR-GRE PMG)

Other recent studies or literature reviews have been completed by Craig L. Solum and Associates, Cowger, et. al, and the Wisconsin PSC for the Arrowhead to Weston transmission line.

Solum Study

In the Solum study, a firm of Wisconsin Certified Real Estate Appraisers, was hired by Northern States Power (d/b/a Xcel Energy) to collect market substantiated information on the impact attributable to the imposition of transmission line easements on residential property values in suburban and undeveloped areas near Eau Claire and La Crosse, Wisconsin. The Solum group examined 200 residential property transactions adjacent to or in close proximity to high voltage electric transmission lines in urban, suburban and rural areas of western Wisconsin during the mid 1990's. The selection process used in his study concentrated primarily on upper price level residences and vacant lots ready for construction on the assumption that these properties would be most sensitive to potential negative influences. In the report, Mr. Solum asserted that the very minor positive and negative impact results he observed indicate that there is virtually no impact present that is attributable to the presence of a transmission line encumbrance on residential properties.

Cowger Study

The 1996 Cowger study found that overhead high voltage transmission lines had minimal impacts on residential property values in Seattle and Vancouver. The literature review complete for that study also indicated the following: (Cowger, et. al, 14):

1. Overhead transmission lines can reduce the value of residential and agricultural property. The impact is usually small (0 – 10 per cent) for single family residential properties.
2. Other factors such as location, improvements and lot size are more likely to be major determinants of sale price.
3. Impacts on sales are most likely to occur on property crossed or immediately adjacent to the lines.
4. In areas where the right-of-way has been landscaped or developed for recreational use, positive impacts have been measured.
5. Impacts may be greater on small properties than for larger properties.
6. Impacts are more pronounced immediately after construction of a new line and diminish over time.

Arrowhead to Weston EIS

In the Final Environmental Impact Statement on the Arrowhead-Weston Electric Transmission Line Project, the Wisconsin Public Service Commission (PSC) addressed the issue of property value changes associated with HVTL (EIS at 212-215). This document summarized the findings of approximately 30 papers, articles and court cases covering the period of 1987 through 1999. The Arrowhead-Weston EIS provides six general observations:

1. The potential reduction in sale price for single family homes may range from 0 to 14 percent.
2. Adverse effects on the sale price of smaller properties could be greater than effects on the sale price of larger properties.
3. Other amenities, such as proximity to schools or jobs, lot size, square footage of a house and neighborhood characteristics, tend to have a much greater effect on sale price than the presence of a power line.
4. The adverse effects appear to diminish over time.
5. Effects on sale price are most often observed for properties crossed by or immediately adjacent to a power line, but effects have also been observed for properties farther away from the line.
6. The value of agricultural property is likely to decrease if the power line poles are placed in an area that inhibits farm operations.

Property value decreases in coastal states, such as California and Florida can be quite dramatic. In Midwest states such as Minnesota, Wisconsin and the Upper Peninsula of Michigan, the average decrease appears to be between 4 and 7 percent. The authors succinctly summarize the dilemma in the closing paragraph which states, "It is very difficult to make predictions about how a specific transmission line will affect the value of specific properties."

Canadian Studies

In 1995, two university professors named Stanley Hamilton and Gregory Schwann published a highly empirical study of residential home prices in Vancouver, British Columbia (436). The study contrasted sales in four separate Vancouver neighborhoods of residences adjacent to power lines of 60 kV or greater from 1985 to 1991. The sample size was 12,097 transactions in the four study areas. The authors concluded, "We find that properties adjacent to a line lose 6.3 percent of their value due to proximity and the visual impact" (Hamilton at 436).

Haider and Haroun did a quantification of property value impacts of high voltage transmission lines examining 27,400 freehold residential properties sold in the Toronto area during 1995. This research presents summary statistics, uses several econometric models and spatial autoregressive techniques to analyze the data. This research offers strong evidence to the claim that proximity to HVTL lowers property values. Results suggest that properties within one kilometer lose between 4.0 to 6.2 percent of their total value strictly due to power line effects. The loss in value decreases with distance from the power lines.

SECTION 6.8 POLE RELOCATION: POTENTIAL ECONOMIC IMPACTS ON LOCAL GOVERNMENT

The Issue

Along many of the routes under consideration, particularly on the 115-kV line, the new transmission line will parallel highways or roadways. And when sharing roadway right-of-way, Xcel Energy plans to install the new poles five feet inside neighboring property. This is partly for safety reasons, but also to avoid potential liability for the cost of moving the poles if the roadway is expanded in the future. That is, if a utility pole must be relocated to accommodate a roadway expansion and the pole is within the public right-of-way, the utility is liable for the relocation cost. But if the pole is outside of the public right-of-way, the local unit of government must pay for the relocation. Many of the roadways along the 115 kV route segments are township roads, so the issue is largely related to the 115-kV line. For the 345-kV routes along I-90, the Minnesota Department of Transportation describes its policy in a letter in Appendix I of the Xcel Energy Application. (Utility poles are required to be placed outside the right-of-way except in hardship situations.) Representatives of Nobles and Murray Counties have both expressed concern about the potential for future local government liability should the poles along new routes need to be relocated in the future.

Safety Requirements

Liability is not the only issue related to utility pole placement along highways and roadways. The poles must also be located such that they do not present a safety hazard. Requirements for clear zones and roadside obstructions vary based on traffic volume, design speed, roadside geometry, radius of horizontal curve, presence of a curb, and presence of urban or rural roads, collectors, arterials, or freeways. Thus, this review provides a basic summary of requirements from state and federal manuals.

For very low volume local roads such as township roads the American Association of State and Highway and Transportation Officials (AASHTO 48) state that "at locations where a clear recovery area of 2 m (6 ft) or more in width can be provided at low cost and with minimum social/environmental impacts, provision of such a clear recovery area should be considered." However, they also state that where constraints make this impractical, clear recovery areas of less that 2 m may be used. They also suggest consideration of other factors such as the presence of vehicles wider than 2.6 m (8.5 ft) such as farm equipment.

AASHTO (104) reports that studies have indicated that on high-speed highways, a relatively traversable width of approximately 9 m (30ft) from the edge of the traveled way permits about 80 percent of the vehicles leaving the highway to safely stop and return to the roadway. They further state that while this is not a "magic number" and the application of engineering judgment is necessary, the 30 foot width has been used extensively as a guide for recovery zones. The State of Minnesota Department of Transportation Road Design Manual Part I and Part II Chapter 4 (4-6(6)-4-6(20)) provides charts to determine clear zone widths based on

speeds and side slope type. is replaced with a cut slope, a clear zone of 28 feet is recommended.

There are eleven different tables in the Minnesota manual for determining clear zone widths based on daily traffic, cut or fill slopes, and design speed. In addition, the State of Minnesota also provides a formula for adjusting the clear zone on the outside of horizontal curves and a table for increasing clear zone widths when there are curbs greater than 4 inches. Given the complexity of roadway design, it is not appropriate to generalize about what is considered "safe" in regards to placing transmission line poles adjacent to roadways. The safe zone would have to be determined case by case.

Mitigation

To assess the potential economic impact on local government presented by the various route options, local roadway expansion plans were reviewed. A summary of these plans are provided by county in Appendix G. The only potential conflict between a route segment under consideration and a roadway expansion plan is in Nobles County, where transmission line segments C1 and E3 parallel the road 3.5 miles of C.R. 72.

Xcel Energy will work with the County Highway Departments to ensure the construction of the transmission lines will not conflict with planned roadway projects within the counties. Specifically, Xcel Energy will work with Nobles County to locate the poles and avoid needing to move poles along C.R. 72 if segments C1 and/or E3 are chosen for the transmission line route.

SECTION 7.0 FEASIBILITY AND COMPATIBILITY WITH LONG-RANGE TRANSMISSION PLANS

This section of the EIS is divided into the following three sections:

Section 7.1 Grid Reliability;
Section 7.2 Cost;
Section 7.3 Construction Time;
Section 7.4 Compatibility with Wind Resource Development;
Section 7.5 Compatibility with Long-Range Transmission Plans (Advisability of Double-Circuit Structures).

SECTION 7.1 GRID RELIABILITY

There are two types of reliability concerns presented by double-circuiting with existing transmission lines: (1) during construction and (2) after construction. In both cases the issue primarily arises where the new 345-kV line would be built as a double circuit with one or both of the existing 161-kV lines in the project area (Split Rock to Heron Lake Line, and Lakefield Junction to Triboji Line). Reliability is not a major issue for 69/115 kV double-circuit lines on the new 115-kV line, during construction or after.

161-kV Reliability During Construction

All route alternatives proposed in this EIS are feasible from a technical standpoint. However, if the Alliant route is selected for the 345-kV line, or if the 345-kV line is installed as a double-circuit with the existing161-kV Triboji Line (south of the Lakefield Junction Substation), the 161-kV line would have to be taken out of service during construction. According to Xcel Energy and other utilities consulted on the issue, constructing a double-circuit high voltage transmission line while the existing line is still "hot" is possible, but both dangerous and prohibitively expensive. Therefore, in order to maintain grid reliability for local load serving during construction, the outages must be carefully coordinated with Alliant Energy and Great River Energy (Application, 106). The primary problem this creates is delay. Excel Energy estimates it would take at least one year longer to construct the 345 kV line on the Alliant route than on the I-90 route. See EIS section 7.3 below for more information on construction schedule.

After Construction

Grid reliability can be affected by double-circuit lines after construction as well. Obviously, if a pole goes down in an outage, both lines are out of service, increasing the number of customers affected. (Application, 105-106). In addition, Shoemaker (2004, in press) argues that in these

times of heightened security, the separation of key facilities may be useful in preventing outages from multiple facilities at one time. However, Xcel Energy does not believe that installing a double-circuit 345/161 kV line on the Alliant route presents long term grid reliability problems.

SECTION 7.2 COST

The cost varies for each route depending on length, number of corner structures, the substation location chosen, line removal costs, and double circuiting. The total estimated costs for selected routes are shown in Table 1 (in EIS Sections 1 and 8). The costs for individual route segments are provided in Appendix H. Additional cost details are provided in the Application on page 18, and in Xcel Energy responses to EQB information requests in EIS Appendix E. The following unit costs per mile, provided by Xcel Energy and assumed in the EIS, are as follows:

Table 7
Assumed Unit Costs for Transmission Lines (Per Mile)

345 kV Single Circuit	$500,000
345/161 kV Double Circuit	$650,000
115 kV Single Circuit	$350,000
115/69 kV Double Circuit	$500,000

SECTION 7.3 CONSTRUCTION TIME

Xcel Energy is currently estimating that the two transmission lines can be constructed by approximately August 2007. The following schedule for the 345-kV line is taken from the Xcel Energy Application (p. 15):

345 kV Construction Schedule

EQB Permit	April 2005
Survey Permission & Survey	April 2005 to June 2005
Line & Substation Design	May 2005 to October 2005
ROW Acquisition	September 2005 to January 2006
Transmission Line & Substation Construction	April 2006 to August 2007

Alliant Route Delay

However, if the Alliant route is selected, Xcel Energy currently believes that the required construction time would be at least one year longer than this. In addition, it is possible that construction could only occur during certain times of the year, delaying the in-service date of the

transmission line by as much as sixteen months (Application 105-106). According to Xcel Energy's most recent analysis, the primary reason for this delay is that to maintain local reliability during construction on the Alliant route, only one section of the line can be worked on at a time. However, Xcel Energy continues to study the issue with input from other local utilities. (See EQB Information Requests 11-14 in Appendix E.)

115 kV Schedule

The following schedule for the 115-kV line is taken from the Xcel Energy Application (p. 15):

115 kV Construction Schedule

EQB Permit	April 2005
Survey Permission & Survey	April 2005 to May 2005
Line & Substation Design	May 2005 to September 2005
ROW Acquisition	August 2005 to January 2006
Transmission Line & Substation Construction	June 2006 to August 2007

SECTION 7.4 COMPATIBILITY WITH WIND RESOURCE DEVELOPMENT

During the scoping process, some comments addressed whether the 115 kV route or substation decision should be at least partly based on the location of nearby planned wind projects so they could interconnect to the grid at lower cost. Regarding some of the larger projects in the area, as of November 1, 2004, there are two in the EQB permit queue: a 150 MW project located in Lincoln County and a 100 MW project in Murray County. There another is 100.5 MW located in Jackson and Martin Counties that has already received a state wind permit. Finally, in a presentation given by Wind on the Wires on June 22, 2004, the "Draft Update to the Midwest Wind Development Plan" predicts 1000 MW of additional wind development in the southwest Minnesota region by 2010 (Schuerger 12).

Wind Resource Potential

The efficiency of wind turbines at lower wind speeds has improved recently and will continue to improve. Partly as a result, there is not a significant difference between the wind development potential along the various routes or substation locations under consideration. In addition, the exact locations of many of the future developments on the ridge are not currently known. The proposed transmission line routes are all already located along Buffalo Ridge where the probability of interconnection is likely greater, when taking into account high wind resource areas and the pattern of development northwest to southeast (See Figure 1, above). The Nobles County substation will include a 34.5 kV yard to accommodate interconnection of wind generation, and the future Fenton substation will be located along the 115 kV line near Chandler,

Minnesota to accommodate wind generation interconnection (Application at 42). It is likely that small and large wind developers have plans throughout the project area to build projects near the transmission lines and proposed substations to minimize interconnection costs. One such project that the EQB is aware of is the Community Wind South Project, currently planned for the area east of the proposed Site B for the Nobles County substation.

SECTION 7.5 ROUTE COMPATIBILITY WITH LONG-RANGE TRANSMISSION PLANS (ADVISABILITY OF DOUBLE-CIRCUIT STRUCTURES)

Xcel Energy is currently facilitating a study of possible short term (2007-2008) "incremental" transmission upgrades in Southwest Minnesota. And other longer-range planning, for the 2010-2012 time frame, is assessing the impacts of additional wind development beyond 825 MW on the transmission system (Rasmussen 9 November 2004). A final report on the incremental study will be available in early 2005. See Xcel Energy response to Information Request 9, in EIS Appendix E.

Xcel Energy believes that long range transmission planning for the area is generally not far enough along to be able to meaningfully assess the compatibility of particular routes to these plans. See Xcel Energy response to Information Request 9, in EIS Appendix E. However, one potential method for dealing with long term transmission needs is to construct the proposed lines with one circuit, but with structures that are capable of having a second circuit or higher voltage line added in the future.

EQB Authority to Order Double Circuit Structures

The EQB has the authority to order one or both of these transmission lines to use structures that are capable of expansion to higher voltage or multiple circuits in an effort to increase future transmission capacity without the cost and delay of building a new line using new right-of-way. See Minn. Stat. §116C.57, Subd. 9(b).

115-kV Double Circuit

For the 115-kV line, Xcel Energy does not believe that using structures capable of double-circuiting is advisable because a second line on the same structures would not necessarily result in additional capacity. A second 115-kV line between the new Nobles County Substation and a new Fenton Substation is under serious consideration to increase capacity, but the underlying assumption of that study is that the new line would be on separate right of way. (Xcel Energy's ongoing "Buffalo Ridge Incremental Generation Outlet Transmission Study.") For reliability and operational reasons two 115-kV lines between Fenton and Nobles would have to be separated by at least a mile or so to use the additional transfer capacity of the second 115-kV line. (See also, e.g., Appendix 2 of the Xcel Energy's December, 2001 Certificate of Need Application, titled *Southwest Minnesota/South Dakota Electric Transmission Study*, at page 10, listing reasons for capacity limits on a second Nobles County to Chanarambie 115 kV circuit. Xcel Energy is also

preparing additional detailed analysis of this issue to be submitted at the public hearings for this project.

345-kV Double Circuit

For the 345-kV line, past regional transmission evaluations have recommended "that consideration be given to having the 345-kV line be constructed with double-circuit structures." *Southwest Minnesota/South Dakota Electric Transmission Study*, at page 3 (Conclusions and Recommended Plan). However, Xcel Energy's further analysis indicates that the incremental cost of installing structures capable of double circuiting (about $7.5 million) on the I-90 route is not justified because it is not likely that a second 345-kV circuit on that route will prove to be as attractive as other 345-kV route options into the Twin Cities. See Xcel Energy response to Information Request 14, in EIS Appendix E.

On the other hand, if the Alliant route were selected by the EQB, most of the new line would already be constructed as a 161/345-kV double circuit. In that case, the small incremental cost of slightly larger structures, insulators and other improvements needed to be upgrade the 161-kV circuit to a 345-kV circuit in the future may be cost-effective. (EQB staff opinion, not Xcel Energy's necessarily.)

Xcel Energy is completing further analysis of whether installing structures capable of double-circuiting would be cost effective, for both the 115-kV and 345-kV lines.

SECTION 8.0 ROUTE AND ROUTE SEGMENT COMPARISONS

There are numerous route segments under consideration for both the 345 kV line and the 115 kV line. These segments can be combined into over 100 different complete routes. However, to simplify route analysis, Xcel Energy's proposed routes and several possible alternative routes for each line are shown on overview maps in Appendix A. Summary data of major route criteria are provided below in Table 1 for these selected routes. (Table 1 is repeated here for convenience). Data for each individual route segment is provided in Appendix H. Comparisons for other entire routes can be calculated by replacing applicable segments in the selected EIS routes with data for the replacement segments.

The major natural features in the area include wetlands, waterfowl, and native prairie remnants. There are only two wetlands on any of the routes that may not be able to be spanned, on segment T9 in Nobles County, and segment T13 in Jackson County. Other potential environmental and socioeconomic issues are discussed above in EIS Section 6. There is no impact expected to a significant or unique environmental, archeological, or other feature along any route under consideration that cannot be reduced or avoided through careful construction and design (such as designs to reduce bird impacts or avoid impacts to native prairie.) Instead, the route decision appears to be a balancing of the following five major criteria:

- Minimize interference with farming operations;
- Avoiding homes to reduce exposure to magnetic fields and minimize aesthetic impacts (people don't like to look at them);
- Minimize loss of tree groves and reduced property values;
- Minimize waterfowl and other bird collisions;
- Minimize cost and construction time, and maintain reliability.

345 kV Line

On the 345 kV line, the two obvious right-of-way sharing opportunities are along I-90 or along the existing 161 kV line to the north. In addition, the final route could be a combination of the I-90 and the Alliant routes, using crossing segments.

Neither the I-90 nor the Alliant route follows existing right-of-way for its entire length. Along segment T5, the Alliant route diverts off the existing transmission line to follow roadway right-of-way. Although the optional route segment R1 continues to follow the existing transmission line, and area that is designated as critical habitat for the Topeka Shiner. This issue is discussed in EIS Section 6.5, above.

Table 1 (repeated)
Summary Comparison of Selected Alternative Routes

Route Option	Length	Transmission ROW (miles)	Roadway ROW (miles)	Total ROW Required (Acres)	Houses <300'	Houses <1000'	# of WMA and WPA w/in 2 miles	# of PWI Waters Crossed	Corners	Costs
345 kV Route Options										
Route 1 Xcel I-90 Route	88.0	19.5	65.3	692.0	5	57	12	28	27	$51,189,117
I-90 W/ Option A (Jackson Co.)	88.0	18.5	62.4	767.2	4	56	15	25	27	$51,826,592
Route 2 Xcel Alliant Route	85.7	67.6	6.7	272.3	12	30	11	23	25	$58,320,072
Alliant W/ Option B (Jackson Co.)	85.2	68.8	8.7	261.3	10	26	11	27	23	$58,549,163
Alliant W/ Option C (Jackson Co.)	84.7	69.8	6.7	214.8	11	33	12	24	21	$58,283,755
115 kV Route Options										
Route E Xcel East	36.6	0.0	35.6	192.3	18	16	18	12	12	$13,417,520
Example East Option B	36.6	0.0	34.6	205.3	15	17	15	13	14	$13,417,520
Example East Option C	37.5	8.5	35.6	153.3	12	16	24	11	14	$15,114,010
Route W Xcel West	36.0	13.5	29.1	128.3	10	12	8	12	17	$15,441,670
Example West A from Sub C	36.0	13.5	30.1	128.3	10	12	8	12	17	$15,441,670
Example West A from Sub A	36.5	13.0	31.2	139.3	12	11	9	12	21	$15,548,680

Substation	Cost
Substation Modifications	
Split Rock	$2,500,000
Lakefield Junction	$1,260,000
Chanarambie	$750,000
New Substation	
Nobles County	$18,000,000
Total Costs	$22,510,000

The I-90 route diverts off the interstate west of Worthington to avoid the airport (segment B11 and T9), where it cuts north along about 3 miles on new right-of-way on the section line. Otherwise the major area with multiple route options on the 345 kV line is the easternmost seven to eight miles, near the Lakefield Junction Substation. Xcel Energy's proposed routes in this area, including its preferred I-90 route, are shown in Figure A3 in Appendix A. Alternative route Option A in this area is shown in Figure A4. Option A turns north across a section line about five miles west of Xcel Energy's I-90 route to avoid some homes and businesses along I-90.

The other two highlighted possible routes, Alliant Option B and Alliant Option C, are variations on Xcel Energy's Alliant Route. These two alternative routes in the area are somewhat longer that Xcel Energy's route, require more corner structures, and cross more farm fields. They are designed primarily to provide alternatives that avoid residences along the proposed Xcel Energy route.

345 kV Data Comparison

Table 1 partly illustrate the trade offs between the I-90 and Alliant routes. The I-90 route appears to come to within 300 feet of fewer residences than the Alliant route. This is somewhat misleading, however, because all but four or five of the residences along the Alliant route are already located near the existing 161 kV line. So, along both routes, there are about four to five residences that would be within 300 feet of a *new* line. There are about twice as many residences within 1000 feet of the I-90 route than along the Alliant route.

Also, because the Alliant route largely follows existing transmission right-of-way, it requires a little less than half the amount of new right-of-way area (acres) than the I-90 route. The Alliant route also avoids affecting the views and land uses along the I-90 corridor. The new double-circuit single pole structures on the Alliant line, however, would be about 40 feet taller than the existing structures. So the view would change for people along that route, too. The Alliant route also requires at least five miles of new right-of-way in Jackson County, in the area east of the Lakefield Junction Substation, which the I-90 route could avoid.

Overall, the major advantage of the I-90 route is cost and speed. Xcel Energy estimates that the I-90 route would cost a least $7.3 million less than the Alliant route. And perhaps more importantly, the Alliant route might take at least one year longer to construct. Finally, although the numbers of wildlife management areas and waterfowl protection areas within two miles are similar for the two main route alternatives, the Alliant route does cross through the Rock River WMA, and some proposed segments come within one mile of South Heron Lake in Jackson County, which is a prominent waterfowl area.

115 kV Data Comparison

Table 1 indicates that Xcel Energy's East routes and the other East route options cost about $2 million less that West routes, primarily because they share little or no right-of-way with existing 69-kV lines. Double circuiting with the existing 69-kV lines costs about $150,000 more per mile than a single-circuit 115 kV line. The East routes also require fewer corner structures than the West routes.

On the other hand, compared to the East routes, the West routes (1) require less new right-of-way area because of this double-circuiting, (2) have fewer nearby residences and (3) cross near fewer designated wildlife management areas (WMA) and waterfowl protecton areas (WPA). In addition, segment E2 on the East route crosses near a large number of wetlands that do not show up in the data in Table 1, but can be seen in the detailed maps in Appendix D. However, regarding potential waterfowl impacts, segment W5 on the West route crosses immediately adjacent to the important Chandler Wildlife Management Area, which may outweigh other waterfowl concerns along the East route in that area (See DNR letter to Xcel Energy in Application, Appendix H.)

Finally, on any route using Highway 266 (segment EW1), the number of nearby residences increases because the 115 kV connection to Highway 266 would have to pass near homes in and near the town of Reading.

Other differences between alternatve 115 kV routes on individual residences, tree groves, or farm fields occur on a detailed segment by segment level.

SECTION 9. REFERENCES

American Association of State Highway and Transportation Engineers. 2001. *A Policy of Geometric Design of Highways and Streets.*

American Association of State and Highway and Transportation Officials. 2001. *Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400).*

American Wind Energy Association. 2004. *Wind Project Data Base: Minnesota Wind Energy Development*. http://www.awea.org/projects/minnesota.html, Retrieved September 30, 2004.

Avian Power Line Interaction Committee (APLIC). 1994. *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994*. Edison Electric Institute. Washington, D.C.

California EMF Program. 2002. *An Evaluation of Possible Risks from Electric and Magnetic Fields (EMFs) from Power Lines, Internal Wiring, Electrical Occupations and Appliances and Policy Options in the Face of Possible Risks from Power Frequency Electric and Magnetic Fields (EMF).* California Department of Health: 383.

Cowger et al. 1996. *Transmission Line Impact on Residential Property Values*. Right of Way: 13.

EnerNex Corporation and Wind Logics, Inc. 2004. *Characterization of the Wind Resource in the Upper Midwest: Wind Integration Study – Task 1*. Xcel Energy and Minnesota Department of Commerce: 75 pp. http://www.state.mn.us/mn/externalDocs/Commerce/Characterization_of_Wind_Resources_in_Upper_Midwest_092804023227_WindResource-UpperMidwest.pdf Retrieved: September 30, 2004.

Farm Service Agency. 2003. *NAIP Orthophotos, Jackson County, Minnesota*.

Farm Service Agency. 2003. *NAIP Orthophotos, Murray County, Minnesota*.

Farm Service Agency. 2003. *NAIP Orthophotos, Nobles County, Minnesota*.

Farm Service Agency. 2003. *NAIP Orthophotos, Rock County, Minnesota*.

Haider, Murtaza and Antoine Haroun. 2000. *Impact of Power Lines on Freehold Residential Property Values in the Greater Toronto Area*. Master's Thesis, Department of Civil Engineering, University of Toronto.

Hamilton, Stanley and Gregory Schwan. 1995. *Electric Transmission Lines and Property Value*. Land Economics 71(4): 436.

Jensen, GA and Weber W.V. 1982. High voltage transmission lines and their effect on farm land value in west central Minnesota. Luverne, Minnesota: Jensen Management Service Inc.

Jensen Management Service, Inc. 1980. *A study of the effect of high voltage powerlines on living and working conditions.*

Kroll, C.A. and Priestly, T. 1992. *The effects of overhead transmission lines on property values: a review and analysis of the literature*. Prepared for the Edison Electric Institute Routing and Environmental Planning Task Force.

Minnesota Department of Natural Resources. 2004. *Recreation Compass: Schoeberl WMA.* Retrieved: November 12, 2004. http://www.dnr.state.mn.us/maps/compass.html?map=COMPASS_MAPFILE&mode=indexquery&shapeindex=857&qlayer=wmabdpy3_query

Minnesota Department of Transportation. 2000. *Road Design Manual (English).* http://dot.state.mn.s/tecsup/rdm/english/4e.pdf. Retrieved November 12, 2004: Chapter 4.

Minnesota Environmental Quality Board. 2004. *Environmental Assessment for Great River Energy 115 kV Proposal – Plymouth Maple Grove*. EQB Docket No. 03-65 TR-GRE-PMG.

Minnesota Environmental Quality Board. 2004. *Environmental Assessment for Xcel Energy Lakefield Junction – Fox Lake 161 kV Transmission Line*. EQB Docket No. 03-64-TR-Xcel.

Minnesota State Interagency Working Group on EMF Issues. 2002. *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options.* http://www.health.state.mn.us/divs/eh/radiation/emf/emfrept.pdf

Olden, Kenneth. 1999. *1999 NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*. National Institute of Environmental Health Sciences, National Institutes of Health. Research Triangle Park, North Carolina.

Rasmussen, Mrs. Pamela Jo. Letter to Mr. John N. Wachtler. 14 July 2004. Response to Information Request 1. Eau Claire, WI.

Rasmussen, Mrs. Pamela Jo. Letter to Mr. John N. Wachtler. 9 November 2004. Response to Information Request 8 and 9. Eau Claire, WI.

Schuerger, P.E., Matt. 2004. *Update on Transmission Planning for Wind Power in the Upper Midwest: The Road to Market*. Wind on the Wires: 12 pp. http://www.solpath.com/luna/admin/documents/WOW_062204_Transmission_Planning.pdf Retrieved: September 30, 2004.

Shenehon Company. 2004. *Results of Power Line Study in Maple Grove, MN*.

Shoemaker, Ph.D., Darryl. *Management of Cumulative Impacts in Transmission Line Siting*. In Press.

Solum, Craig and Associates. *Transmission Line Impact Study Based on Paired Sale Comparisons of Residential Properties Located within Northwest and West Central Wisconsin*. Spooner, WI: 13.

Stevens, et. al. 1999. *Possible Exposure to Residential Electric and Magnetic Fields*. National Academy of Science, National Research Council: 132.

Transmission Lines and Property Values: State of the Science, EPRI, Palo Alto, CA: 2003. 1005546.

United States. Department of the Interior. Fish and Wildlife Service. *Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for the Topeka Shiner; Final Rule*. Vol 69, No. 143. Federal Register, July 26, 2004.

United States Fish and Wildlife Service. 2004. *Construction Projects Affecting Waters Inhabited by Topeka Shiners (Notropis Topeka) in Minnesota: Project Recommendations and Guidelines for Meeting Endangered Species Act Section 7 Requirements*. Twin Cities Field Office, Bloomington, MN. http://midwest.fws.gov/endangered/fishes/tosh-prj-rec.pdf. Retrieved: September 30, 2004.

United States Geological Survey. 1992. *Digital Orthophoto Quadrangles, Sioux Falls, SD*.

United States Geological Survey. *Numerous Quadrangles in SW Minnesota, Minnesota, 7.5 Minute Series Topographic Map*. Reston, VA.

Weber, W.V. and G.A. Jensen. 1978. A study of high voltage power line easements and their effect on farm land values in west central Minnesota. Luverne, Minnesota: Jensen Management Service.

Wisconsin Public Service Commission. 2000. *Arrowhead-Weston Transmission Project, Final Environmental Impact Statement (EIS)*. pp. 5-21.

Wisconsin Public Services Commission. 2004. *Environmental Impacts of Transmission Lines.* http://psc.wi.gov/consumer/brochure/document/electric/6010b.pdf

Xcel Energy. 2003. *In the Mater of the Application of Northern States Power Company (d/b/a Xcel Energy) for Certificates of Need for Four Large High Voltage Transmission Line Projects in Southwestern Minnesota*. PUC Docket No.: E-002/CN-01-1958.

Xcel Energy. 2004. *Application to the Minnesota Environmental Quality Board: Route Permit Application, Split Rock Substation to Nobles County Substation to Lakefield Junction Substation 345*

kV Transmission Line and the Nobles County Substation to Chanarambie Substation 115 kV Transmission Line and the Nobles County Substation. Docket No.: 03-73-TR-XCEL.